February 16, 2010

Ms. Kimberly Tisa
PCB Coordinator
U.S. Environmental Protection Agency Region 1
5 Post Office Square – Suite 100
Boston, Massachusetts 02109-3912

Re: PCB Remediation Plan
Peabody Terrace Housing Facility
Cambridge, Massachusetts

Dear Ms. Tisa:

On behalf of the President and Fellows of Harvard College (Harvard), please find attached a remediation plan prepared in accordance with the requirements for a risk-based clean-up and disposal request per 40 CFR Part 761.61(c). This plan details the proposed remedial approach for polychlorinated biphenyl (PCB) bulk product waste (caulking) and PCB remediation waste (impacted building materials and certain adjacent ground surfaces) at the Peabody Terrace Housing Complex (the Site) located at 900 Memorial Drive in Cambridge, Massachusetts. This plan presents the proposed remedial approach for PCB-affected media at Building A; future remediation plans for other site buildings will be submitted as addenda to this plan.

This submittal includes characterization data, descriptions of any interim remedial actions conducted to date, the results of pilot tests, a data usability assessment, a discussion of remedial objectives and cleanup levels, the remediation approach for each PCB-affected media, a schedule for completing the remediation work, a communications plan, and a plan for long-term monitoring and maintenance of select media. The majority of this information was discussed during our project meeting at EPA on January 12, 2010.

If you have any comments, questions, or require further information, please do not hesitate to e-mail or call me at the number listed above. Pending your review and approval, Harvard is prepared to commence work in the Spring of 2010.

Sincerely,

WOODARD & CURRAN INC.

Jeffrey Hamel, LSP, LEP
Senior Vice President

Project Number 210980

Enclosure(s)

cc: Karen Sardone, Harvard
Chris Packard, JLL

Peabody Terrace Façade Project – PCB Remediation Plan

Building A

Harvard University
Cambridge, Massachusetts

Project No. 210980

Harvard University

February 2010

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COMMITMENT & INTEGRITY DRIVE RESULTS

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EXECUTIVE SUMMARY

This plan details the proposed remedial approach for polychlorinated biphenyl (PCB) bulk product waste (original caulking) and PCB remediation waste (impacted building materials and certain adjacent ground surfaces) at the Peabody Terrace Housing Complex (the Site) located at 900 Memorial Drive in Cambridge, Massachusetts. This plan presents the proposed remedial approach for PCB-affected media at Building A; future remediation plans for other Site buildings will be submitted as addenda to this plan.

The President and Fellows of Harvard College (Harvard) became aware of the potential for PCBs to be present at the Site during the planning phases of an extensive exterior façade repair/rehabilitation project that includes replacing damaged concrete, removing and replacing exterior caulking, and applying an exterior façade waterproofing system. Upon review of the building construction information and in consideration of the widespread use of caulking manufactured with PCBs as part of standard construction practices from the 1950's to the late 1970's, the exterior caulking was tested for PCBs at one of the buildings in 2009. Characterization samples collected from the caulking as well as adjacent materials confirmed the presence of PCBs in certain exterior building caulking (up to 139,000 parts per million [ppm]), adjacent concrete surfaces (up to 4,430 ppm), adjacent soils (up to 50.1 ppm), and interior caulking (up to 223 ppm).

In accordance with 40 CFR 761, exterior original caulking (PCB bulk product waste) and replacement caulking (PCB remediation waste) will be removed for off-site disposal. However, the removal of PCB-impacted concrete on the building façade is not considered to be a feasible option for site-wide remediation given structural concerns as well as the potential for disturbance to tenants. In order to eliminate the exposure pathway presented by concrete containing PCBs in excess of applicable cleanup levels, these surfaces will be encapsulated as a risk-based approach under 40 CFR 761.61(c). Pilot testing of several products has demonstrated that on-site encapsulation is a feasible and effective option, and products have been selected to encapsulate concrete within joints, vertical concrete surfaces (façades), and horizontal concrete surfaces (balconies and patios). After building façade work is complete, soils containing PCBs in excess of applicable cleanup levels will be excavated for off-site disposal.

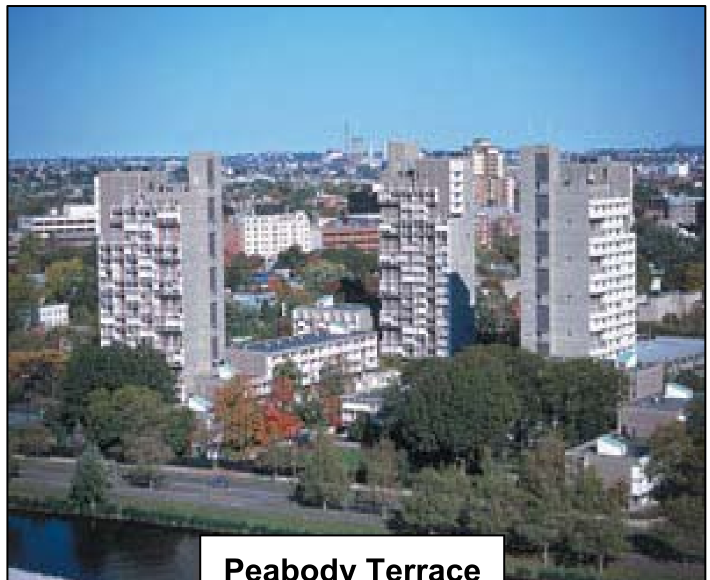
Interior replacement caulking, located around the window and door frames within residential units, will also be removed for off-site disposal. However, as it has been determined that the source of PCBs to this 1990's caulking (i.e., non-PCB manufactured caulking) is the underlying building material which cannot be removed for structural reasons nor encapsulated due to inaccessibility, restoring these joints will include installing new replacement caulking and covering the joints with a direct contact barrier (e.g., metal trim or a flexible strip).

Remediation activities will be initiated immediately upon approval of this plan. The remediation work will focus initially on Building A, allowing Harvard to evaluate the remedial activities and refine the approach as needed. It is currently anticipated that remediation work can be completed at multiple buildings per year for a completion of all nine buildings by the end of 2012. Based on the data collected to date, it is not anticipated that this schedule would cause incremental potential health risks in comparison to a more accelerated schedule.

This plan proposes a combination of remedial techniques that, once applied at the Site, will eliminate the existing exposure pathways presented by PCB-containing caulking, building materials, and soils. The remediation is intended to serve as an interim solution only, and implementation of a monitoring and maintenance plan will ensure that the containment technologies continue to perform as intended, or until these materials can be properly managed and disposed at building demolition/renovation.

1. INTRODUCTION

Woodard & Curran has prepared this remediation plan on behalf of the President and Fellows of Harvard College (Harvard) to comply with U.S. Environmental Protection Agency (EPA) requirements for a risk-based clean-up and disposal per 40 CFR Part 761.61(c). This plan describes the characterization data collected and details the proposed remedial approach for polychlorinated biphenyl (PCB) bulk product waste (original caulking) and PCB remediation waste (replacement caulking, impacted building materials, and certain adjacent ground surfaces) at the Peabody Terrace Housing Complex (the Site) located at 900 Memorial Drive in Cambridge, Massachusetts (Figure 1-1).

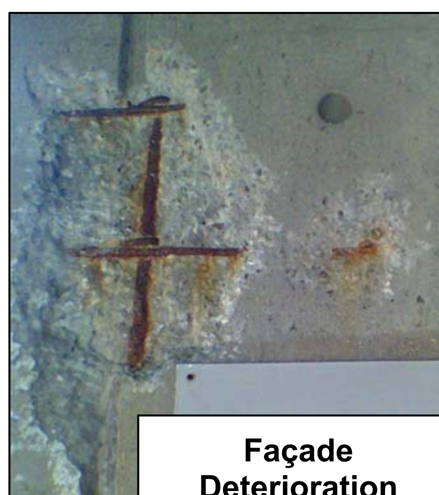


Peabody Terrace

The Peabody Terrace housing facility, originally constructed in 1964, consists of three high-rise towers (Buildings X, Y, and Z; 22 stories each) and six lower rise buildings (Buildings A, B, C, D, E, and F; 3-7 stories each). The buildings are currently used for Harvard graduate student housing and contain a total of 492 apartments. Peabody Terrace also features several on-site childcare facilities, laundry rooms, common rooms, and outdoor play areas.

The Peabody Terrace facility is bordered by Banks Street to the east, by Akron Street to the south, by Memorial Drive to the west, and by the Corporal Burns Playground and Flagg Street to the north. The Charles River is located approximately 200 feet west of the Site opposite Memorial Drive. Surrounding ground surfaces are generally flat in elevation and are either covered with asphalt pavement, concrete, landscaped areas (grass, wood chips, stone, or shrubs/plant beds), or other surfaces associated with the playground areas (refer to the Site Plan, Figure 1-2).

1.1 BACKGROUND



Façade Deterioration

Certain portions of Peabody Terrace exterior concrete façades and balconies are in various stages of disrepair, including cracking, spalling, and other deteriorating conditions given the age of the buildings and other contributing factors (e.g., construction details). In some instances, pieces of concrete have broken off the building and fallen to the ground surface, creating a significant safety hazard. As an interim measure, scaffolding has been erected in several areas of the complex to create covered walkways adjacent to the buildings. All buildings in the complex were constructed during the same time period and followed a similar design.

Harvard has been planning an extensive exterior façade repair and rehabilitation project to address these conditions, which includes replacing damaged concrete, removing and replacing exterior building caulking, and applying an exterior façade waterproofing system. The implementation of the exterior façade repair project has been segmented into three, one-year construction phases due to the number of buildings involved. The first group of buildings identified for renovation included Buildings A, B, C and X (see Figure 1-2). As the planning stages for this project progressed, the potential for the exterior caulking to contain PCBs given the date of building construction was assessed and reviewed.

Given the uncertainty regarding PCBs in the caulking and the potential migration on to the building exterior façade if PCBs were present, one building was selected for initial and extensive characterization testing. This building, Building A, would be used as the model for developing an understanding of the nature and extent of PCBs on the buildings. Given the building information and that the caulking was planned for removal, the exterior caulking was tested for PCBs as well as other potential hazardous materials (asbestos) in the Spring of 2009.

The initial Building A results indicated that percent level concentrations of PCBs (up to 139,000 ppm total PCBs) were detected in samples of original exterior caulking. Based on this information, Harvard re-focused their efforts (i.e., collected samples from locations besides Building A) to ensure that tenants or users of Peabody Terrace were not subject to unsafe conditions based on the presence of PCBs in the exterior caulking. Characterization samples were collected and evaluated at the following areas:

- Exterior locations with higher exposure potential and likely PCB transport pathways (i.e., designated play areas adjacent to buildings and lawns adjacent to ground-floor patios across the complex);
- On-site daycares and interior common rooms throughout the complex where it was likely that children may be present; and
- Apartment interior surfaces and attached exterior patios and balconies (Building A only).

As an initial step in the data evaluation process, action levels were developed using a combination of published regulatory information or derived using standard health risk-based approaches. These action levels and the results of the data collection and evaluation of these areas is presented in Appendix A. Based on a comparison to these action levels, the following interim stabilization controls have been implemented across the complex:

- Barriers, such as new caulking and/or silicone strips, have been applied to exposed caulking, and an acrylic coating has been applied to exterior concrete walls, where designated play areas include building façades;
- Geofabric and new mulch has been applied to soils in the only play area with PCBs detected in soils over 1 ppm;
- Soils adjacent to Building A not under a surface covering (e.g., stone) and exhibiting concentrations > 10 ppm within 12 inches of the ground surface were excavated and removed from the Site; and
- Ground surface coverings adjacent to exterior building facades across the complex were refreshed (additional stone, etc.) and will continue to be inspected and refreshed as needed to maintain their covering.

This work, including data analysis, risk evaluation, and interim measure implementation resulted in stabilized conditions in these higher exposure potential areas. The results of these initial assessment activities were communicated to the daycare providers, parents of children in daycares, tenants, and Peabody Terrace workers through meetings, drop-in sessions, and written communications. A summary of this data, exposure evaluations, and stabilization measures with regard to the exterior play areas, daycare facilities, and residential units is provided in Appendix A. Given the context of this submittal (Building A Remediation Plan), the interior Building A data is also presented in the body of this plan along with the Building A exterior data.

After confirming that conditions were stable in high exposure potential areas, additional Building A characterization sampling activities were conducted in support of developing a remediation plan to be implemented on schedule with the original façade renovation project.

1.2 CONCEPTUAL SITE MODEL

Certain joint caulking used as part of standard construction practices for masonry buildings and concrete structures erected between the 1950's and late 1970's is known to have been manufactured with PCBs. PCBs were added to caulking for durability, resistance to degradation, and as a softener/plasticizer for application. Production and approved usage of PCBs was halted in the United States in the late 1970s. As indicated above, Peabody Terrace was constructed during this time period.

Due to the porous nature of concrete and other masonry surfaces, PCBs in caulking may penetrate into adjacent building materials during application or over time, may leach or weather, and/or may be disturbed during renovations or other building work. A window replacement project was conducted at the Site between 1993 and 1995, which included the removal and replacement of window and door caulking at both exterior and interior locations.

Characterization data, primarily collected at and around Building A, indicates that percent level concentrations of PCBs have been detected in original building caulking (around concrete column and panel joints). Lower concentrations of PCBs have also come to be located in adjacent building concrete, adjacent ground surface coverings, and a 1990's replacement caulking via various migration and transport pathways.

1.3 PLAN ORGANIZATION

This Remediation Plan is organized into the following sections:

Section 2: Site Characterization

The characterization section provides a summary of the characterization data that have been collected to date and delineates the nature and extent of PCBs in each media. Most characterization data collected to date have been focused on Building A. This section also includes analytical summary data tables, photographs, and sample location maps.

Section 3: Pilot Testing

The results from several pilot tests conducted to assess different remedial technologies and select the proposed remedial methods are presented in this section, including data from before and after pilot test implementation.

Section 4: Data Usability Assessment

The data quality and data usability assessment performed on the primary samples collected to date in support of characterization activities is presented in this section. The precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) evaluation includes an assessment of those parameters as well as quality assurance / quality control (QA/QC) samples as they affect the usability of sample results.

Section 5: Remediation Plan

The remediation plan section includes a discussion of the remedial objectives and cleanup levels, the remediation approach for each PCB-affected media, a proposed sequence of activities, and a verification sampling approach. This remediation plan has been prepared according to the requirements for a 40 CFR 761.61(c) risk-based disposal request for the cleanup, disposal, and/or encapsulation of PCB remediation waste at the Site.

Section 6: Communications

This section describes the communications between Harvard and the parties at Peabody Terrace affected by current conditions and upcoming work, including residents, employees, and contractors.

Section 7: Schedule

This section outlines a general sequence of the proposed remedial activities.

A copy of the written certification signed by the owner of the property is provided in Appendix B.

2. SITE CHARACTERIZATION

This section provides a discussion of the nature and extent of PCB-affected media encountered at and around Building A. Accordingly, PCB-affected media are identified, described, and depicted on figures identifying sample locations to provide a cross-reference to data summary tables; these figures include a Building A elevation plan with attached photos (Figure 2-1) and a Building A ground surface plan with sample locations (Figure 2-2).

During characterization activities, samples were collected from building materials (caulking and concrete), adjacent ground surface coverings (soil, asphalt, concrete, and brick), interior surfaces (bulk and wipe samples of various media), and indoor air in 2009-2010 in observance of proper sample collection techniques, analytical methods, and reporting procedures. Samples were primarily collected from Building A with the understanding that this initial characterization data would serve as a model for complex-wide conditions and could be used to determine whether any interim remedial actions were required until additional characterization data could be collected from other on-site buildings.

Photographs of the western façade (left photo) and eastern façade (right photo) of Building A are presented below.

2.1 CHARACTERIZATION SAMPLE COLLECTION

Characterization sampling was conducted to determine the nature and extent of the building materials and adjacent ground surface coverings potentially impacted by PCBs originating from the building joint caulking. A total of 354 primary samples have been collected and analyzed for PCBs as of the date of this report. A breakdown of samples collected by media is provided below:

- Exterior building material samples:
    - Bulk caulking (16 samples; concentrations ranging 17.5 to 139,000 parts per million [ppm])
    - Caulking wipes (18 samples; concentrations ranging from < 0.5 (ND) to 850 micrograms per 100 square centimeters [ug/100cm^2])
    - Bulk concrete (58 samples; concentrations ranging from < 0.033 to 4,430 ppm)
    - Adjacent surfaces wipes (14 samples; concentrations ranging from < 0.5 to 5.9 ug/100cm^2)
    - Pilot test wipes (43 samples; concentrations ranging from < 0.5 to 35 ug/100cm^2)

- Adjacent ground surface covering samples:
  - Asphalt (6 samples; concentrations ranging from < 0.63 to 0.8 ppm)
  - Brick (2 samples; both reported with PCBs less than 0.2 ppm)
  - Concrete (2 samples; both reported with PCBs less than 0.1 ppm)
  - Soil (26 samples; concentrations ranging from < 0.033 to 50.1 ppm)
- Interior residential unit samples:
  - Bulk caulking (3 samples; concentrations ranging from 18.9 to 223 ppm)
  - Caulking wipes (22 samples; concentrations ranging from < 0.5 to 29 ug/100cm^2)
  - Adjacent surface wipes (27 samples; concentrations ranging from < 0.5 to 2.5 ug/100cm^2)
  - Inner walls beneath caulking (2 samples; bulk concrete at 20.7 ppm, metal wipe at 2.6 ug/100cm^2)
  - Indoor air (5 samples; concentrations ranging from 68 to 101 nanograms/m^3)
- Daycare / play area samples:
  - Interior caulking wipes (27 samples; concentrations ranging from < 0.5 to 4.3 ug/100cm^2)
  - Interior adjacent surface wipes (43 samples; concentrations ranging from < 0.5 to 3.1 ug/100cm^2)
  - Exterior bulk samples (1 caulking [0.67 ppm]; 8 sand [< 0.03 to 0.05 ppm]; 12 soil [< 0.03 to 2.49 ppm])
  - Exterior caulking wipes (12 samples; concentrations ranging from < 0.5 to 104 ug/100cm^2)
  - Exterior adjacent surfaces wipes (7 samples; concentrations ranging from < 0.5 to 5.9 ug/100cm^2)

The summary above includes those samples collected to evaluate pilot test effectiveness as well as complex-wide samples to assess higher potential exposure areas; the summary does *not* include quality assurance / quality control (QA/QC) samples (field equipment blanks and field duplicates), which were collected at an approximate frequency of one per twenty primary samples. For reference, a sample identification plan describing the sample naming convention for the Site is included as Appendix C.

2.1.1 Sample Collection Methods

Caulking samples were collected by cutting and scraping the caulking from the joint with hand tools. If adjacent media (e.g., concrete or a foam backer rod) was inadvertently removed in the process of sample collection, this media was physically removed from the caulking before the sample was placed in its sample container.

Concrete sampling on horizontal surfaces was conducted in accordance with the USEPA Region I Draft Standard Operating Procedure for Sampling Concrete in the Field (December 1997); concrete was ground into dust using a hammer drill to a depth of 0.5 inches into the concrete. After pulverizing the concrete, the material was placed into a sample container using a dedicated spoon at each sample location. Sampling of other paved horizontal surfaces (brick and asphalt) was conducted using similar methods.

Concrete sampling on vertical surfaces (panels or columns) was conducted by sawcutting in order to achieve the precise intervals desired to delineate migration of PCBs from a caulked joint. Cuts were made into the concrete to a depth of 0.5 inches and spanned a length necessary to achieve the required sample volume. Where continuous interval sampling was planned (e.g., 0 to 0.5 inches, 0.5 to 1 inches, 1 to 1.5 inches, etc.), adjacent intervals were staggered at two locations on the concrete panel so that the concrete eliminated by the width of the saw blade would not result in lost material in the next adjacent sample. After saw cuts were made, the bulk material was chipped from the vertical surface using hand tools and placed in the appropriate sample containers.

Soil sampling was conducted in accordance with generally accepted procedures for collecting surface soils for the purpose of environmental analysis. A trowel was used to collect soils from the specified ground surface interval (0 to 3 inches below ground surface [bgs]). Soils were then homogenized and transferred to an appropriate sample container.

Wipe samples were collected in general accordance with the standard wipe test as defined in 40 CFR 761.123. All samples were collected from the prescribed 100 cm^2 area using a laboratory-prepared gauze pad. While the standard wipe test prescribes the use of hexane-preserved gauze pads for collecting wipe samples from non-porous surfaces, many samples were collected from porous surfaces (e.g., caulking); as such, some wipe samples were collected using saline-preserved wipes, isopropyl alcohol wipes, or dry wipes in addition to the standard hexane wipes.

Where samples were collected with hand tools, all reusable sampling equipment was decontaminated between each sampling location by scrubbing with a biodegradable soap and water solution (Alconox) followed by a water rinse. A new pair of clean Nitrile gloves was used at each location where gloves came into contact with sample media, including at each wipe sample location.

Indoor air and background outdoor air samples were collected for PCB analysis in accordance with USEPA Compendium Method TO-10A guidelines. A low volume polyurethane foam (PUF) cartridge was connected to a low-flow personal air pump with flexible tubing positioned between 3 and 5 feet above the floor. To achieve the desired minimum laboratory reporting limit of 5 nanograms per cartridge, samples were collected at a flow rate of 2.5 liters per minute for two hours (300 liter sample volume). At the end of the required sample interval, pumps were shut off and the labeled cartridges were wrapped in aluminum foil and placed on ice for delivery to the analytical laboratory.

2.1.2 Laboratory Analysis

All bulk and surface wipe samples were logged on standard Chain-of-Custody (COC) forms and stored on ice for delivery to Analytics Environmental Laboratory of Portsmouth, New Hampshire. All samples were extracted using USEPA Method 3540C (Soxhlet Extraction) and analyzed for PCBs using USEPA Method 8082.

All indoor and outdoor air samples were logged on standard COC forms and stored on ice for delivery to Alpha Analytical Laboratory in Mansfield, Massachusetts. All air samples were extracted and analyzed in accordance with USEPA Compendium Method TO-10A guidelines for laboratory analysis of PCB homologs in air samples.

The complete laboratory analytical reports for the characterization data are provided in CD format in Appendix D.

2.2 SITE CHARACTERIZATION RESULTS

Based on the concentration and distribution of PCBs detected in Building A building materials and adjacent ground surface coverings, it is apparent that the caulking used in original building construction was the source of PCBs. Concentration gradients identified in the adjacent building materials demonstrate a reduction in total PCBs with increasing distance from caulked joints, and adjacent soils demonstrate a reduction in PCB concentrations with increasing distance from the building façade and increasing depth from the ground surface.

The results of the characterization data are presented in the following sections by medium, which include:

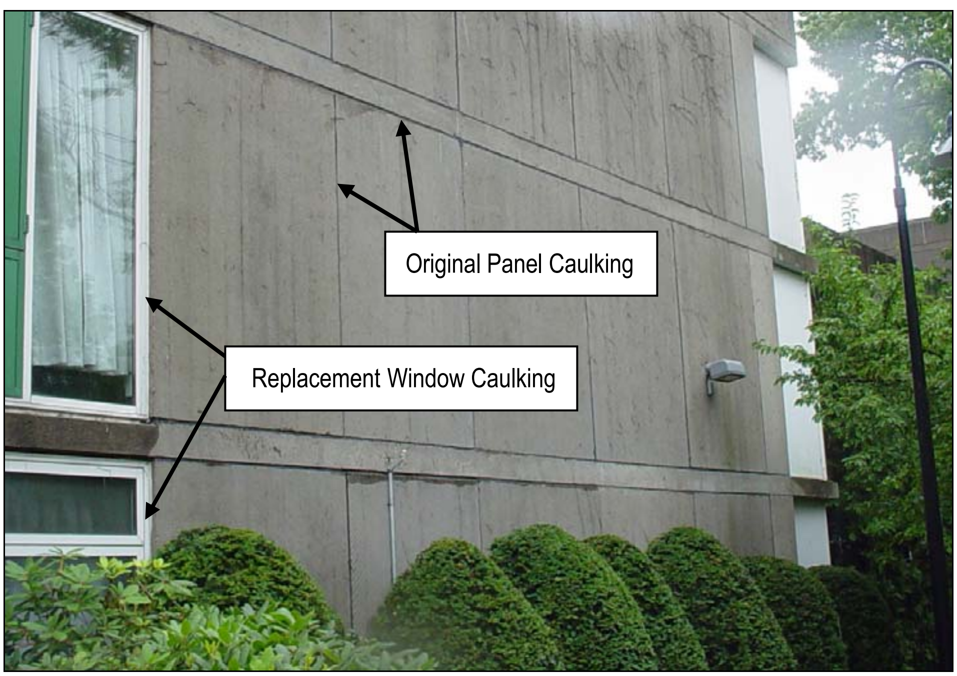
- Exterior Building Caulking

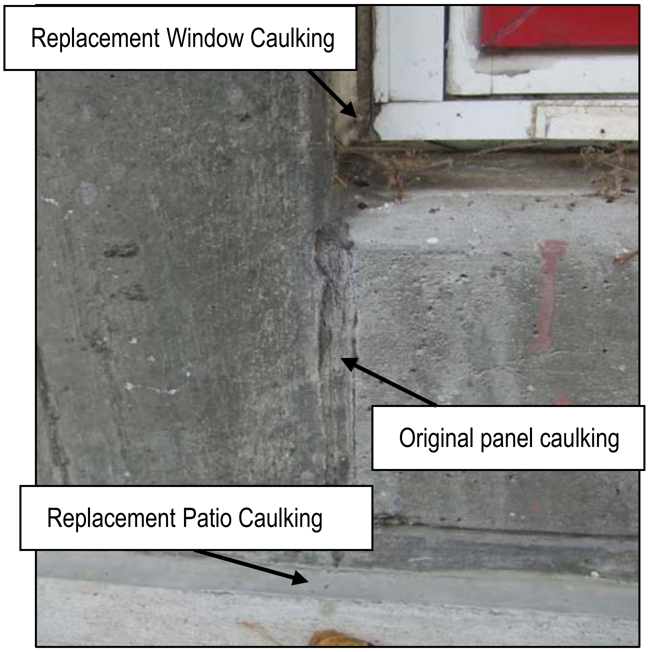
- Concrete in Direct Contact with Caulking
- Concrete Not in Direct Contact with Caulking
- Concrete Patios
- Concrete Balconies
- Paved Adjacent Ground Surface Coverings
- Soils
- Interior Residential Unit Caulking and Accessible Surfaces
- Indoor Air

2.2.1 Exterior Building Caulking

Bulk caulking samples were collected from various Building A surfaces and joint types in May 2009 to determine the levels of PCBs present in each caulking material. These samples comprised the first data set collected for the Site, and included bulk samples from the north and south façade panel caulking, north façade window caulking, west façade panel caulking on the vertical wall above first floor patios, and north façade concrete crack fillers/sealants. To supplement this data set, additional bulk samples were collected from patio ground level caulking and balcony caulking, and wipe samples from panel joint caulking and window/door joint caulking. A summary of the bulk caulking data is provided as Table 2-1.

The north façade of Building A is typical of a Site building face with panel and column caulking materials, as shown in the photo below. Bulk samples collected from a variety of these caulking materials were reported with PCB concentrations ranging from 158 to 8,150 parts per million (ppm). While most joints contain original caulking, Harvard reports that periodic repairs have been conducted as part of site renovations or waterproofing work. As such, the panel and column caulking consists of a combination of PCB bulk product waste (original products manufactured with PCBs) and/or PCB remediation waste (PCBs have come to be located in the replacement caulking via transfer from the adjacent original caulking or concrete).





The exterior caulking present on the western façade of Building A includes not only the panel caulking and window caulking as described above, but also includes additional materials associated with the patios (ground floor) and balconies (upper floors). Laboratory data from the vertical wall panel caulking joints above two patios and one balcony at Building A and caulking at the horizontal joint between the building wall and balcony surface reported PCB concentrations in the 70,400 to 139,000 ppm range. In addition, ground floor patios contain a light gray caulking joint sealing the patio pad to the wall joint determined to be new within the last 15 years. Two samples of this material were reported with PCBs at 27.8 and 64.9 ppm. A photo of a ground floor patio is shown at left. These results are discussed further in Sections 2.2.4 (Patios) and 2.2.5 (Balconies) along with results from the other media sampled in these areas.

The exterior caulking observed around window and door joints is a white replacement caulking reported with PCBs at 17.5 and 57.7 ppm (two samples). Harvard reports that the window caulking installed during original building construction was removed during a window replacement project in the mid-1990's. These PCB concentrations are indicative of replacement material, where the original source of the PCBs has been removed. Given this information, the apparent transport mechanism for PCBs to have come to be located in the replacement caulking is via transfer from the adjacent building materials (i.e., concrete) which were impacted by the original caulking, and subsequent re-leaching from the concrete back into the new adjacent caulking. This material is present at a concrete panel to metal frame joint as shown in the photos above.

In summary, the characterization data set indicates that exterior caulking at the following locations contains PCBs:

- Original caulking (bulk product waste) – PCB concentrations > 50 ppm:
  - Horizontal and vertical joints between façade panels and columns;
  - Upper-floor balcony slab joints;
  - Approximately 4,200 linear feet.
- Replacement caulking (remediation waste) – PCB concentrations > 1 ppm:
  - Window and door joints;
  - Ground-floor patio slab joints;
  - Approximately 2,800 linear feet.

2.2.2 Concrete in Direct Contact with Caulking

Woodard & Curran collected seven samples of concrete from vertical building surfaces in direct contact with the caulking within panel or column joints. The building material sampling activities were conducted with the assistance of a mason from Chapman Waterproofing. After removing caulking from the joints by physical means (scraping with hand tools) concrete samples were collected from within the joint utilizing a rotary saw and other hand tools. Direct contact concrete samples were collected within 0.5 inches of the caulking to the full depth of the joint (typically 1.5 to 2 inches into the building from the outer façade).

Samples were collected from the following areas:

- Unit 22-11, west face, vertical panel caulking joint sample;
- Unit 18-21, north face, horizontal and vertical panel caulking joint samples;
- Unit 19-11, east face, horizontal panel caulking joint sample;
- Unit 22-11 and 18-12 patios;
- Unit 21-31 balcony.

The concrete was sampled in order to determine the level of PCBs that may have leached into these adjacent materials over the period of time when PCB-containing caulking was present on the building. Given the release mechanism, concrete in direct contact with the caulking would likely contain more elevated PCB concentrations than concrete not in direct contact with the caulking.

The seven direct contact concrete samples were reported with PCB concentrations ranging from 0.34 to 4,430 ppm. A table presenting the results is provided as Table 2-2. In summary:

- The four direct contact samples collected from panel & column caulking joints were all reported > 1 ppm, with an average concentration of 81 ppm;
- The balcony direct contact sample, collected from the vertical surface of the wall panel directly above the balcony slab, was reported with PCBs at 4,430 ppm. As this result was reported an order of magnitude higher than any other direct contact concrete samples, it is possible that the sample contained caulking remnants with the concrete that may have influenced the elevated result.
- Both direct contact samples collected from patio caulking joints were reported at < 1 ppm (0.34 and 0.48 ppm). Unlike the balcony direct contact sample, the patio direct contact samples were collected from the horizontal surface of the patio slab. The mason assisting with sample collection estimated that the ground floor patio slabs appeared to have been replaced in the last 15 years as evidenced by a plastic expansion joint (used only in recent construction) beneath the caulking at the patio-wall joints. As such, the < 1 ppm results for the patio concrete are consistent with what would be expected for new concrete poured beside new caulking.

The characterization data set indicates that direct contact concrete (i.e., beneath caulking) at the following locations contains PCBs confirmed or assumed to be > 1 ppm and is considered a PCB remediation waste per 40 CFR 761.3 (a total of approximately 7,000 linear feet):

- Horizontal and vertical joints between façade panels and columns;
- Upper-floor balcony slab joints;
- Window and door joints.

Although no direct contact concrete samples were obtained from a window or door joint due to concerns of damage while collecting samples, PCB concentrations in window caulking collected in May 2009 (17.5 – 57.7 ppm) indicate that the concrete in direct contact with this caulking may contain PCBs at similar levels and should be included in the overall remediation plan.

Given the direct contact concrete results reported < 1 ppm at the two first-floor patio sample locations, the direct contact concrete at these locations (first-floor patio pads) does not warrant remediation (however, as described in Section 5, all patios will be coated with an acrylic coating as part of the exterior faced restoration/repair work); patio characterization results are discussed further in Section 2.2.4.

2.2.3 Concrete Not in Direct Contact with Caulking

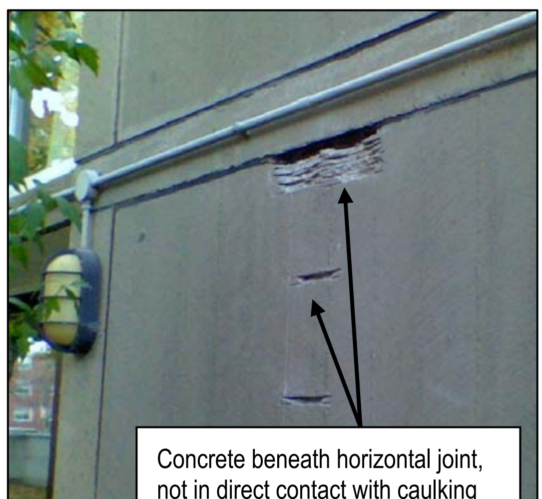
In October 2009, Woodard & Curran collected a total of 37 primary bulk concrete samples from Building A exterior surfaces *not* in direct contact with caulking joints. In addition to the primary samples, 19 discretionary concrete samples were collected from locations more distant from the caulking joints. These discretionary samples were to be analyzed only if primary sample results indicated that PCB impacts migrated beyond the lateral extent covered by the primary samples. The building material sampling activities were conducted with the assistance of a mason from Chapman Waterproofing.

Using a rotary saw and other hand tools, samples were collected from the following areas:

- Unit 22-11, west face, indirect contact concrete panel samples (vertical caulking joint);
- Unit 22-11, west face, indirect contact concrete column samples (vertical caulking joint);
- Unit 18-21, north face, indirect contact concrete panel samples (horizontal & vertical joints);
- Unit 18-21, north face, indirect contact concrete window sill samples (horizontal & vertical joints);
- Unit 19-11, east face, indirect contact concrete panel samples (horizontal caulking joint).

As described in Section 2.2.2 above, the concrete was sampled in order to determine the level of PCBs that may have migrated to these adjacent materials. Given the release mechanism, concrete in direct contact with the caulking would likely contain more elevated PCB concentrations, and concrete not in direct contact with the caulking would likely contain levels of PCBs that decreased with increasing distance from the caulking joints. In order to quantify the concentrations of PCBs in Building A concrete walls with increasing distance from the joint, samples were collected as described below. A table summarizing the bulk sample results discussed in this section is provided as Table 2-3.

Six primary indirect contact samples and up to four discretionary indirect contact samples were collected from each sample location. The six primary indirect contact samples and two of the discretionary indirect contact samples were collected from a section of concrete between zero and four inches from the caulking, where each of the samples were collected at increasingly distant 0.5-inch wide intervals from the caulking joint. The primary concrete samples included material from 0 to 0.5, 0.5 to 1, 1 to 1.5, 1.5 to 2, 2 to 2.5, and 2.5 to 3 inches from the joint; the first two discretionary samples included material from 3 to 3.5 and 3.5 to 4 inches from the joint. If the material was available, two additional discretionary samples were collected at distances of 12 to 12.5 and 24 to 24.5 inches from the joint, to be analyzed in the event that PCBs in the next nearest samples exceeded 1 ppm.


Concrete beneath horizontal joint, not in direct contact with caulking

Indirect contact concrete sampling was conducted by sawcutting in order to achieve the precise intervals desired to delineate migration of PCBs from a caulked joint. Cuts were made into the concrete to a depth of 0.5 inches and spanned a length necessary to achieve the required sample volume. Where continuous interval sampling was planned (e.g., 0 to 0.5 inches, 0.5 to 1 inches, 1 to 1.5 inches, etc.), adjacent intervals were staggered in two locations on the concrete panel so that the concrete eliminated by the width of the saw blade would not result in lost material in the next adjacent sample. After saw cuts were made, the bulk material was chipped from the vertical surface using hand tools and placed in the appropriate sample containers.

2.2.3.1 Indirect Contact Concrete – Vertical Joints

Indirect contact concrete was sampled at three locations beside vertical caulking joints. Samples were collected from a second floor concrete panel on the north face and from a first floor concrete panel and adjacent concrete column separated by a vertical caulking joint on the west face of Building A. The northern face is an exposed face (no overhanging roof or balconies are present), and the western face sample area, beside the patio of Unit 22-11, exists beneath a 7.5-foot high overhang created by an overhead balcony.

The results of these samples indicated that detectable concentrations of PCBs had spread laterally from the caulking joint at both of the concrete panel locations and the concrete column to a distance of at least three inches from the joint. The highest concentrations (> 25 ppm) were observed only in the material within 0.5 inches of the joint, and concentrations greater than 1 ppm were observed only within 1.5 inches of the joint at each sample location. This data set also indicates that the presence of PCBs in concrete panels is similar to the presence of PCBs in concrete columns, as demonstrated by the similar decreasing concentration with increasing distance from the joint at this location. A summary of the vertical joint results is provided below:

Sample Interval (inches from caulking joint)	22-11 West Face Vertical Panel (ppm)	22-11 West Face Vertical Column (ppm)	18-21 North Face Vertical Panel (ppm)
Direct Contact	**228**	N/A	**20.9**
0.0 - 0.5	**130**	**132**	**31.3**
0.5 - 1.0	**5.14**	**12.7**	**2.44**
1.0 - 1.5	1.05	**1.31**	0.478
1.5 - 2.0	0.267	0.655	0.074
2.0 - 2.5	0.147	0.379	0.352
2.5 - 3.0	0.143	0.144	0.568

2.2.3.2 Indirect Contact Concrete – Horizontal Joints

Indirect contact concrete was sampled at two locations beneath horizontal caulking joints. Samples were collected from a second floor concrete panel on the north face and from a first floor concrete panel on the east face of Building A. Both sample locations were exposed faces with no overhanging roof or balconies present.

Initial sample results indicated that detectable concentrations of PCBs had spread into the concrete beneath the caulking joint at both locations to a distance of at least three inches from the joint. The highest concentrations (93 ppm on the north side and 25 ppm on the east side) were observed only in the material within 0.5 inches of the joint. PCB concentrations greater than 1 ppm were observed in all samples within 3 inches of the joint at the north face location and all samples within 2.5 inches of the joint at the east face location. This data set indicated that the spread of PCBs beneath horizontal caulking joints is greater than the lateral spread of PCBs beside vertical joints.

Given the first round of data, one discretionary sample was analyzed at each location from the 12-12.5 inch interval beneath the caulked joint. Both of these samples were reported with PCBs < 1 ppm, indicating that the migration of PCBs decreased to concentrations below 1 ppm within 12 inches below a horizontal joint. A summary of the horizontal joint results is provided below:

Sample Interval (inches from caulking joint)	18-21 North Face Horizontal Panel (ppm)	19-11 East Face Horizontal Panel (ppm)
Direct Contact	**69.1**	**7.82**
0.0 - 0.5	**93.4**	**25.5**
0.5 - 1.0	**2.79**	**7.85**
1.0 - 1.5	**4.31**	**5.41**
1.5 - 2.0	**1.80**	**2.03**
2.0 - 2.5	**1.82**	**4.40**
2.5 - 3.0	**1.67**	0.551
12.0 - 12.5	0.810	0.359

2.2.3.3 Indirect Contact Concrete – Window Joints

Indirect contact concrete samples were collected from seven locations within two inches of a second floor window on the north face of Building A. This concrete exists on a plane perpendicular to the building face, creating a concrete sill around four sides of each window due to its slightly recessed location within the façade. The window is recessed by approximately 1.5 inches along the vertical lengths and by approximately 2.25 inches along the horizontal lengths. The three samples adjacent to the vertical joint and the four samples adjacent to the horizontal joint were all reported with detectable concentrations of PCBs; however, all concentrations were reported below 1 ppm with similar concentrations reported at all intervals (range of 0.31 to 0.55 ppm, average of 0.46 ppm). A summary of these results is presented below:

Sample Interval (inches from caulking joint)	18-21 North Face Window – Horizontal Sill (ppm)	18-21 North Face Window – Vertical Sill (ppm)
0.0 - 0.5	0.479	0.387
0.5 - 1.0	0.520	0.551
1.0 - 1.5	0.406	0.314
1.5 - 2.0	0.532	N/A

2.2.3.4 Indirect Contact Concrete Summary

The data confirms that the PCB-containing caulking used in the original building construction has impacted adjacent materials that are not in direct contact with the caulking. These materials are considered PCB Remediation Waste in accordance with 40 CFR 761.3. Concentrations of PCBs exceeding the unrestricted use cleanup level of 1 ppm have come to be located in the following materials via leaching and/or weathering transport mechanisms:

- Concrete within 1.5 inches of vertical caulking joints between exterior columns and panels;
- Concrete within 12 inches beneath horizontal caulking joints between exterior columns and panels;

Concentrations of PCBs were detected below the unrestricted use cleanup level of 1 ppm in the seven indirect contact samples collected from a second floor concrete window sill. However, given that the concrete in direct contact with caulking at window joints will be included in the scope of the remediation plan, the concrete not in direct contact with caulking will also be included in the remediation plan, as described in Section 5.

2.2.4 Concrete Patios – Ground Surface

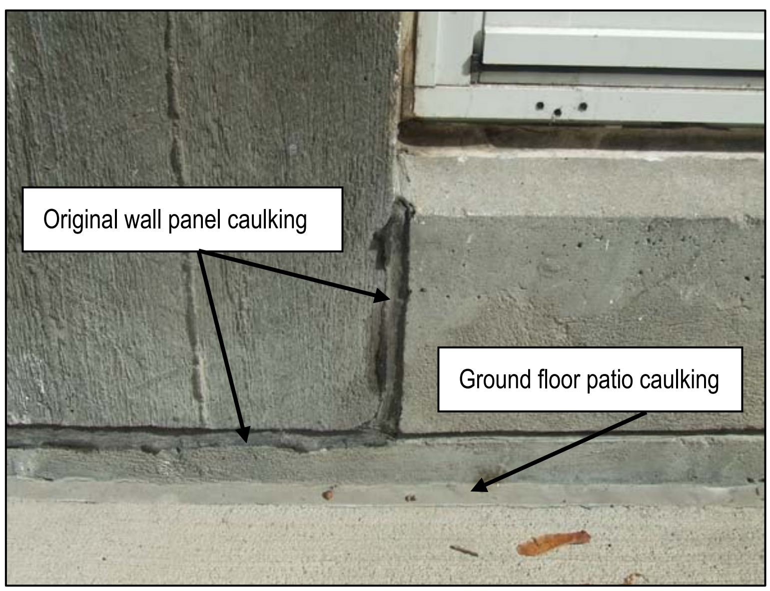
Concrete patios are located outside of each of the ten ground-floor units on the west façade of Building A. Characterization samples were collected from two Building A ground-floor patios (Units 18-12 and 22-11) at the following locations:

- Two random locations on each concrete pad;
- One sample within 0.5 inches of the pad-to-wall caulking joint;
- One direct contact sample (under pad-to-wall caulking joint);
- One bulk caulking sample at the pad-to-wall joint.

A summary of the sample locations and analytical results is provided as Table 2-4.

Each of the two direct contact concrete samples collected from first-floor patio caulking joints were reported with PCBs < 1 ppm (0.34 and 0.48 ppm). Four of the six indirect contact patio concrete samples were reported with detectable levels of PCBs, with all results reported below 1 ppm. The caulking observed at the patio pad-to-wall joints was a light gray caulking observed to be different from any caulking observed on the façade of the building or on upper-floor balconies. In addition, the mason assisting with sample collection estimated that the ground floor patios appeared to have been installed in the last 15 years as evidenced by a plastic expansion joint (used only in recent construction) beneath the caulking at the patio-wall joints.

Bulk caulking samples were collected from the light gray caulking observed along the joint connecting the concrete patio pad to the face at two locations (see photo at right). Although the bulk concrete samples collected from these two patios were both reported with PCBs < 1 ppm, the bulk caulking material was reported with PCBs at 27.8 ppm (Unit 18-12) and 64.9 ppm (Unit 22-11). Although this data appears to be inconsistent with the PCB concentrations reported for the direct contact bulk concrete at the same locations, it is possible that the gray replacement caulking is in direct contact with PCB-impacted concrete (the vertical wall face) and the patio pad is not.



In summary, the Building A first-floor patio data indicates that PCBs are present below the unrestricted use cleanup level of 1 ppm in concrete (i.e., the patio pads), but PCBs exceed the unrestricted use cleanup level of 1 ppm in the light gray caulking present at the joint connecting the horizontal concrete patio pad to the vertical building face. As such, the caulking at this joint has been included in the scope of this remediation plan. Although not required due to PCB concentrations, the patios will be coated with an acrylic coating as part of the overall façade renovation project.

2.2.5 Concrete Balconies – Upper Floors

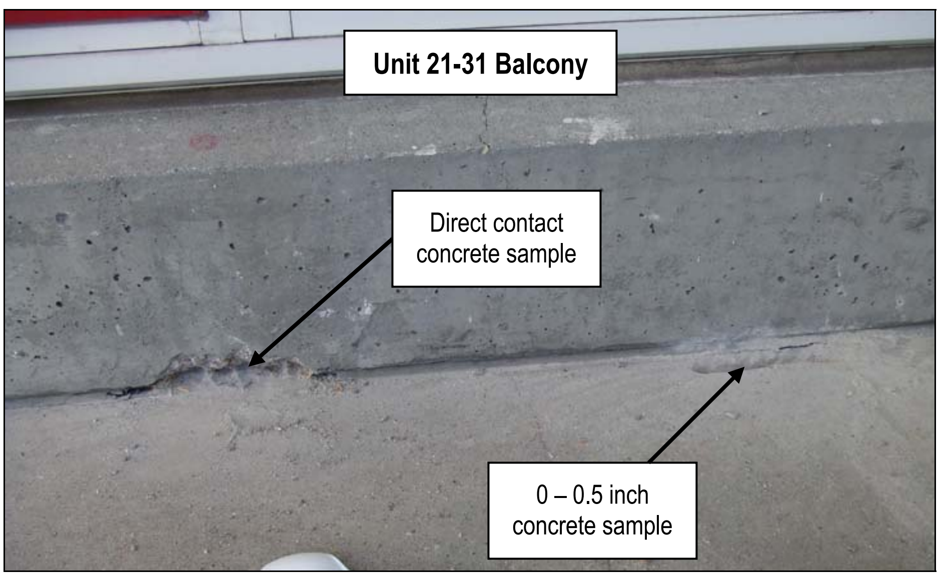
Balconies are present on the west façade of Building A outside each of the 20 upper-floor units. Fifteen of these balconies are single-width balconies (measuring approximately 50 ft^2), and five of these are double-width balconies (measuring approximately 100 ft^2).

Upper floor concrete balconies at Building A are constructed differently than first floor concrete patios on the same building face. While the upper floor balconies were built upon a continuous concrete floor slab that extends beyond the vertical building face, first floor patios were poured as individual concrete pads on the ground surface. In addition, while the first floor patios do not appear to be in direct contact with any original building caulking, the upper floor balconies are in contact with original building caulking.

Characterization samples were collected from two Building A balconies (Units 18-22 and 21-31) at the following locations:

- Two random locations on each concrete pad (underside of 18-22, topside of 21-31);
- One concrete sample within 0.5 inches of the pad-to-wall joint (underside of 18-22, topside of 21-31);
- One direct contact concrete sample (within the pad-to-wall caulking joint, Unit 21-31 only);
- One bulk caulking sample at the pad-to-wall joint (Unit 21-31 only).

Given the building construction, the sample within 0.5 inches of the Unit 21-31 joint was collected from the horizontal surface of the balcony slab, and the direct contact sample was collected from the vertical surface of the wall panel directly above the balcony slab as shown in the photo below.



The results of the two random concrete sample locations from the underside of the Unit 18-22 balcony were both reported < 1 ppm and the sample within 0.5 inches of the joint was reported with PCBs at 36.1 ppm. In contrast, the results of the two random concrete sample locations from the topside of the Unit 21-31 balcony were 2.53 (3 ft from the joint) and 21.4 ppm (1 ft from the joint), the sample within 0.5 inches of the joint was reported with PCBs at 124 ppm, and the sample direct contact was 4,430 ppm. A summary of these analytical results is provided as Table 2-5.

More elevated PCB concentrations on the topside of a balcony than on the underside are to be expected given the release mechanism for PCBs. These levels are also consistent with the result reported for the bulk caulking sample collected from the Unit 21-31 balcony-to-wall joint, which contained PCBs at 139,000 ppm.

Given the results of the balcony bulk characterization data (PCBs > unrestricted use cleanup level of 1 ppm), the surface of the concrete balconies as well as the caulking at the pad-to-wall joint has been included in the scope of this remediation plan.

2.2.6 Paved Adjacent Ground Surface Coverings

A total of 10 asphalt, brick, and concrete samples were collected from paved ground surfaces adjacent to Building A. Asphalt samples were collected from paved walkway locations (two per west, north, and east sides of the building). Brick samples were collected from two walkway locations on the south side of the building within 3 feet of the building face. Concrete samples were collected from Entrance 18 and Entrance 21 east side lobby entry concrete pads.

Asphalt samples were reported as non-detect (ND) for PCBs as they were not detected above laboratory reporting limits (< 0.63 ppm) at four locations and were reported at 0.61 and 0.80 ppm at the two remaining sample locations (east face walkways). The two brick samples collected from the south side of the building were both reported with PCBs < 1 ppm at 0.03 and 0.19 ppm. The two concrete samples were reported as non-detect (Entrance 18 lobby concrete pad) and with PCBs at 0.06 ppm (Entrance 21 lobby concrete pad). A summary of this data is presented as Table 2-6, and a figure depicting the sample locations and analytical results is provided as Figure 2-2.

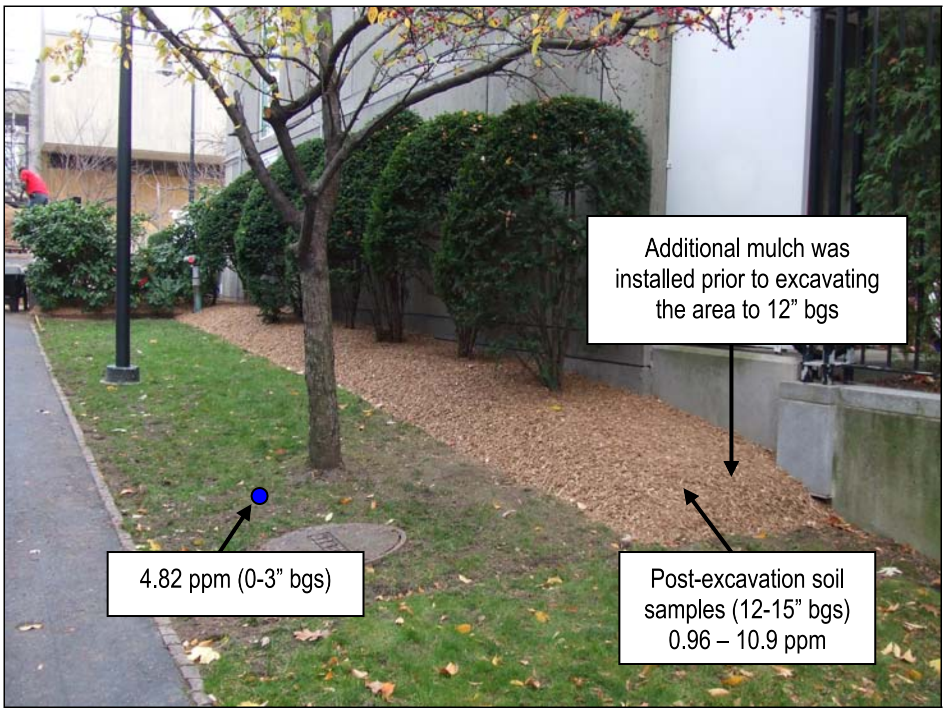
Because all data met the unrestricted use cleanup level of 1 ppm, paved adjacent ground surfaces including asphalt, brick, and concrete pads in front of entry doors are not included in the scope of this remediation plan.

2.2.7 Soils

Soils surrounding the buildings at the Site include grass-covered soils, soil beneath mulch, soil beneath landscaping stone, and a limited amount of exposed soils in areas of high foot traffic or around trees. In October 2009, a total of 12 soil samples were collected from ground surfaces adjacent to Building A. Soils were collected from 6 locations beneath stone or mulch within 18 inches of the building (2 per west, north, and east sides) and from 6 grass-covered locations between 6 and 19 feet from the building (2 per west, north, and east sides).

Adjacent ground surface sample results were reported with PCB concentrations ranging from 0.64 to 50.1 ppm in the six soil samples beneath stone or mulch adjacent to the building, and from 0.59 to 8.05 ppm at the six soil samples within 19 feet from the building.

Because two samples collected from accessible surface soils were reported with PCBs > 10 ppm within 500 feet of a residence (in a mulch bed north of Building A), this triggered a two-hour reporting condition under the MCP.[1] Release Tracking Number (RTN) 3-28873 was assigned to the Site on November 10, 2009 upon notification to MassDEP. On November 11, 2009, Harvard installed landscaping fabric and a layer of mulch over the soils to prevent access until soil removal activities could be completed. On November 12, 2009, MassDEP provided verbal approval of a soil removal Immediate Response Action (IRA). The IRA activities were conducted on November 18, 2009 and consisted of the excavation of approximately 5 cubic yards of soil within 12 inches of ground surface from an area adjacent to the north face of Building A. Five cubic-yard box containers of PCB-impacted soils were shipped for disposal to the Chemical Waste Management (CWM) Services chemical waste landfill located in Model City, New York in accordance with 40 CFR 761.61(b).



Laboratory results of the four verification soil samples collected from the base of the excavation confirmed that the IRA had successfully eliminated the release condition that could pose an Imminent Hazard at the Site[2]. A summary of these results is provided as Table 2-7, and a figure depicting the Building A sample locations and analytical results is provided as Figure 2-2. An IRA Completion Statement was filed on January 7, 2010.

Because concentrations of PCBs in soils have been reported in exceedance of the 2 ppm Reportable Concentration (RCS-1) criteria, additional MCP comprehensive response actions will be necessary at the Site. Current data indicates that no other exposed surface soils have been reported with PCBs > 10 ppm; if this condition is found, further IRA activities would be implemented as necessary. In accordance with 310 CMR 40.0501(4), a Phase I Initial

[1] Although one sample from the east side of Building A was reported with higher PCB concentrations than the north side samples, the 50.1 ppm east-side sample was located beneath a 5-inch layer of landscaping stone over filter fabric, which constituted an effective barrier under the MCP and did not require Immediate Response Actions.

[2] Although one of the confirmatory samples was reported with PCBs > 10 ppm, the depth of the excavation and subsequently restored ground surface eliminated the potential Imminent Hazard by putting 12" of clean backfill over the base of excavation.

Site Investigation (ISI) and Tier Classification will be completed within one year of the initial release notification, and will be submitted to MassDEP by November 10, 2010.

Given the results of the soil characterization activities conducted to date, additional delineation sampling will be required before a soil removal plan can be prepared. In accordance with 40 CFR 761 and site conditions, the remediation goal is to remove contaminated soils and verify that remaining soil concentrations are ≤ 1 ppm.

2.2.8 Interior Residential Unit Caulking and Accessible Surfaces

Interior caulking and underlying foam backer between window (left) and concrete wall (right).

Building A interior residential unit caulking consists of an intact bead of white caulking around the perimeter of the metal window and door frames on the east and west walls; interior doors leading to hallways do not contain caulking at the door frame. The smaller Building A units (e.g., Unit 18-12) contain two windows and one exterior door, for a estimated total 61 linear feet of interior caulking. Larger Building A units (e.g., Unit 22-11) contain three windows and one exterior door, for a estimated total 82 linear feet of interior caulking. This caulking appears to be the same as the white window caulking present on the exterior of the windows and patio/balcony doors. According to project personnel, this caulking was installed in the 1990s during a window replacement project, at the same time as the exterior caulking around the windows. Given the presence of interior caulking, surface wipe samples were collected from each of three vacant Building A apartments to evaluate accessible interior surfaces adjacent to caulking such as window frames, desks, lower walls, and floors (27 samples total; refer to Table 2-8). Twenty-four (24) of the 27 samples reported non-detect levels of PCBs (all collected with hexane-preserved wipes). Three of the adjacent surface samples reported detectable concentrations of PCBs at 0.5, 2.1, and 2.5 µg/100cm^2. All three samples were collected from the lower walls in the living room areas adjacent to the window or door near the unit's patio or balcony.

Surface wipe samples were also collected from interior caulking in each of three vacant apartments (9 samples total). Eight of the nine interior caulking wipe samples detected PCBs ranging in concentration from 0.9 to 8.6 µg/100cm^2. Additional testing was conducted following surface cleaning of the caulking to assess whether the results were related to dust/particulate on the surface of the material. Following cleaning, the results indicated only a slight change in concentration.

Following this initial assessment, additional wipe samples and preliminary bulk samples of the caulking were collected from three units. One hexane-preserved surface wipe and one saline-preserved surface wipe were collected from caulking in Units 18-12, 20-12, and 22-11 prior to collecting bulk samples. The saline wipes are believed to be more representative of direct contact transfer and/or conditions on the surface of the material because it is a less aggressive extractant than hexane and is more similar to the fluids found on human skin.

The hexane wipe samples of the caulking material were reported at concentrations ranging from 0.8 to 21 ug/100cm^2, and the adjacent saline wipes were all reported as non-detect (below laboratory reporting limits of 0.5 ug/100cm^2). Bulk caulking sample results indicated that the interior window / door white caulking contains PCBs at 18.9 ppm (Unit 22-11), 61.5 ppm (Unit 20-12), and 223 ppm (Unit 18-12). These results are consistent with the exterior samples collected from the white window caulking, which detected PCBs at 17.5 and 57.7 mg/kg.

After the initial surface characterization activities, a small-scale intrusive sampling program was conducted in Unit 18-12, where the interior bedroom window bulk caulking sample was reported with PCBs at 223 ppm. In order to gain an understanding of the potential release pathway for PCBs to have come to be located in the interior caulking, the caulking was removed from the joint between the metal window frame and the adjacent concrete wall. The materials that make up this joint include an outer layer of white caulking, followed by two layers of foam backer rods, followed by plastic shim packs to fill the space between the concrete column and the window frame. A dark gray foam backer rod was observed in the space beyond the shim packs, which was assumed to be the rear of the foam backer rod beneath the exterior caulking based on the depth of the joint.

Inspection of this joint allowed for a better understanding of the potential transport pathways by which PCBs have come to be located in the new interior caulking, which is known to have been replaced at the time of the 1990's window replacement project. It appears that the original building construction featured windows that fit more tightly into the concrete masonry and did not originally require the plastic shims. After chipping away some of the concrete along the joint, this observation was supported by the presence of residual traces of gray caulking along a revetment in the concrete where the original windows fit snugly into the wall. This evidence of older caulking on inner portions of the concrete column adjacent to the window frame supports the likelihood that the interior concrete was impacted by the original caulking. A sample collected from this underlying concrete confirmed that PCBs were present in the concrete albeit at a lower concentration of 20.7 ppm.

The vertical section on the left side of the Unit 18-12 living room door was also inspected, where the metal edge of the door frame was sealed to a metal edge cap over the corner of a gypsum wall board. The construction of this joint is similar to the two other locations where bulk caulking samples were collected from Units 20-12 and 22-11 (61.5 and 18.9 ppm, respectively). The materials that make up this joint include an outer layer of white caulking and a foam backer rod, followed by the rear of the foam backer rod beneath the exterior caulking based on the depth of the joint.

It appears that the building construction at this location does not feature any interior pre-cast concrete at the edge of window and doors frames, but rather the window is sealed to the adjacent building materials (a metal right angle cap piece over gypsum wall board). The proximity of the interior building materials to exterior caulking and building materials that are known to have been impacted by PCBs indicates that the presence of PCBs in new interior caulking may be due to migration from inaccessible materials integral to the building construction. A wipe sample collected from the integral metal cap on the gypsum board in direct contact with the white replacement caulking confirmed that PCBs were present at a concentration of 2.6 ug/100cm^2.

A summary of all interior results is provided as Table 2-8. Although the interior caulking was installed in the 1990s and is not considered a bulk product waste (i.e., it was not manufactured with PCBs), the material is considered a PCB remediation waste by definition because concentrations were reported at detectable levels from an unauthorized source material (previously existing caulking). As such, this interior caulking has been included in the remediation plan. An additional discussion on the subsequent risk evaluation of potential tenant exposures in the interim (until remediation is completed) is provided in Appendix A.

2.2.9 Indoor Air

To evaluate the exposure potential from indoor air within residential units, two indoor air samples were collected for PCB analysis from each of two Building A units. Samples were collected from the bedroom and the living room / kitchen area of Unit 18-12 (bulk caulking PCB concentration of 223 ppm) and Unit 20-12 (bulk caulking PCB concentration of 61.5 ppm) to supplement the existing bulk sample and surface wipe data collected from these units. In addition, one ambient outdoor air sample was collected from the courtyard west of Building A for background comparison to indoor air concentrations.

Analytical results from these samples were reported with total PCB homologs at a concentration of 22.3 nanograms (ng) per cartridge in the outdoor air sample, and at concentrations ranging from 22.8 to 34.0 ng/cartridge in the indoor air samples. Converting the reported results to units of nanograms per cubic meter (ng/m^3) for the purposes of comparison to action levels (see Appendix A), the total PCB homolog concentrations were reported at 75.1 ng/m^3 in the background outdoor air and at concentrations ranging from 75.7 to 112.2 ng/m^3 in the indoor air. The average concentration in each of the two residential units was found to be 108.9 ng/m^3 in Unit 18-12 and 80.5 ng/m^3 in Unit 20-12. In comparison to the action levels developed for indoor air at the Site, these results were all reported below the most stringent action level of 140 ng/m^3. A summary of the indoor air results is provided as Table 2-9.

3. REMEDIAL METHOD PILOT TESTING

Several remedial methods were pilot tested to determine the effectiveness and feasibility of encapsulating residual PCBs in place in the concrete façade. These techniques were explored due to several concerns regarding the potential removal and off-site disposal of PCB-impacted concrete; including:

- Structural and weatherproofing concerns on the exterior concrete would not allow removal of concrete across large areas of the building (e.g., removal of concrete from the panel/column joints would result in joints too large to continue to function in their current design).
- The significant noise, vibration, and other disruption that removal methods would cause on a full scale remediation at the buildings with the residents remaining in the buildings. Harvard does not have on-campus housing capacity to accommodate a relocation effort. In addition, relocation would create unacceptable disruptions to the families for other reasons, such as students' performance of their required coursework and their other student obligations (such as research and interaction with faculty and other students) would be seriously impaired by being required to relocate. Their family lives would be similarly impaired. For example, many of the families have young children who attend local daycares and schools.
- Peabody Terrace was designed by Josep Lluis Sert. Given the building's architectural significance, any significant changes to the exterior façade may be incompatible with historic preservation interests.

Pilot tests were conducted on six first floor caulking joints and adjacent surfaces of the north face of Building A to test the effectiveness, implementability, and aesthetic quality of various coatings under consideration as remedial options under 40 CFR 761.61(c). In addition, samples were collected from a balcony coating system previously installed on Building D several years ago to assess the effectiveness (with regard to PCB encapsulation) of a similar type of balcony coating system that is proposed to be installed during the exterior façade repair project on all buildings.

The pilot test implementation steps, results, and conclusions are provided in the following sections.

3.1 BUILDING A PILOT TEST

The goal of the pilot test program was to determine the best method to encapsulate PCBs within the joint (direct contact areas) and in areas not in direct contact with the former caulking.

3.1.1 Pilot Test Implementation

Pilot test implementation took place in several steps over the course of a two-week period in November – December 2009. These steps are outlined in detail on Table 3-1 and are summarized below:

- Surface Preparation (November 25 – November 30)
  - Four first-floor concrete wall panels were power-washed.
  - Using hand tools, caulking was removed from 4 vertical and 3 horizontal joints.
  - After removal with hand tools, the concrete surfaces interior to the joint were mechanically ground to obtain more complete caulking removal at Pilot Test locations 2A, 2B, and 2C and to determine if there were any differences both from a chemical and physical basis (PCB testing as well as adhesion tests of the epoxy bond to the concrete). During grinding, appropriate dust and worker exposure controls were implemented.

- Coating Application (December 1 – December 4)
  - All joint interiors were encapsulated with two coats of Sikagard 62, a protective, colored epoxy coating.
  - Sikagard 62 epoxy was applied to the face of the concrete panel within the first 0.5 inches of the joint at Pilot Test locations 2A, 2B, 2C, and 3 to test areas outside the joint return with higher PCB levels than those areas further away from the joint.
  - EnviroSeal 20, a clear water-based 20% silane penetrating sealer, was applied to the face of the concrete panel within 3.0 inches of the joint at Pilot Test locations 2A (beneath horizontal joint), 1B (right side of vertical joint), and 2B (both sides of vertical joint).
  - Sikagard 670W clear, a water-dispersed acrylic protective anti-carbonation coating, was applied to the face of the concrete panel within 3.0 inches of the joint at Pilot Test locations 1A (beneath horizontal joint) and 1B (left side of vertical joint).
  - Sikagard 670W gray, a water-dispersed acrylic protective anti-carbonation coating, was applied to the face of the concrete panel within 3.0 inches of the joint at Pilot Test location 2C (both sides of vertical joint).
  - Sikagard 550W Elastocolor, a gray, anti-carbonation, crack-bridging coating, was applied to a portion of a concrete panel adjacent to both a horizontal and a vertical joint coated with epoxy as Pilot Test 4.
- First Round Sample Collection (December 8)
  - All first round wipe samples were collected with hexane-preserved wipes over 100cm^2 areas.
  - Wipe samples were collected from inside the epoxy-coated joints at all Pilot Test locations.
  - Wipe samples were collected from the epoxy on the concrete panel face within the first 0.5 inches of the joint at Pilot Test locations 2A, 2B, and 2C.
  - Wipe samples were collected from the panel coatings on the concrete panel face within the first 0.5 inches of the joint at Pilot Test locations 1A (Sikagard 670W clear), 1B (Sikagard 670W clear and EnviroSeal 20), and 4 (Sikagard 550W).
  - Wipe samples were collected from the panel coatings on the concrete panel face between 0.5 and 3.0 inches from the joint at Pilot Test locations 1A (Sikagard 670W clear), 2A (EnviroSeal 20), 1B (Sikagard 670W clear and EnviroSeal 20), 2B (EnviroSeal 20), 2C (Sikagard 670W gray), and 4 (Sikagard 550W).
- New Caulking Application (December 8)
  - All epoxy-coated joints were filled with a new foam backer strip and finished with the installation of Sikaflex 2C, a two-component, non-sag, polyurethane elastomeric sealant.
    - The horizontal joint beneath the Pilot Test 4 location, not subject to a proposed caulking wipe sample, was left without caulking in the event that in-place adhesion tests needed to be conducted on the Sikagard 62 epoxy.
    - The vertical joint selected for Pilot Test 3 was additionally finished with a strip of Sil-Span, a preformed silicone profile used to bridge over existing joints.

- Second Round Sample Collection (December 15)
  - Wipe samples were collected from the surface of the new caulking at each joint with one dry wipe, one saline-preserved wipe, and one hexane-preserved wipe over 100 cm^2 areas. Samples were collected using various extractants to help identify which method provides data most reflective of surface concentrations as well as an indicator of direct contact scenarios (i.e., PCB transfer to skin from a porous surface).
  - Wipe samples were collected from the Sil-Span surface over the caulked joint at Pilot Test 3 using one dry wipe, one saline-preserved wipe, and one hexane-preserved wipe over a 100 cm^2 area.

3.1.2 Pilot Test Results

A detailed table presenting the pilot test preparation methods, products used, and analytical results gathered for each pilot test is presented on Table 3-1. A summary of the wipe sample results of each surface coating product in each of three sample intervals (inside the joint, within 0-0.5 inches of the joint, and within 0.5-3 inches of the joint) is provided below, with all PCB concentrations presented in ug/100cm^2:

	Within Joint				0-0.5 Inches From Joint				0.5-3.0 Inches From Joint			
	No. Samples	Min	Max	Avg	No. Samples	Min	Max	Avg	No. Samples	Min	Max	Avg
Sikagard 62 epoxy	7	< 0.5	1.1	0.41	4	< 0.5	3.9	1.16	–	–	--	–
EnviroSeal 20	--	–	--	–	1	0.9	0.9	0.9	3	< 0.5	35	11.8
Sikagard 670W Clear	–	–	–	--	2	< 0.5	< 0.5	< 0.5	2	< 0.5	< 0.5	< 0.5
Sikagard 670W Gray	–	–	--	–	–	--	–	--	1	< 0.5	< 0.5	< 0.5
Sikagard 550W Elastocolor	–	--	–	–	1	< 0.5	< 0.5	< 0.5	1	0.6	0.6	0.6

The results of the surface wipe samples collected from the new caulking installed over the encapsulating products were reported as non-detect (ND) for PCBs (<0.5 ug/100cm^2) for all sample types (hexane-preserved wipes, saline-preserved wipes, and dry wipes) with the exception of one hexane-wipe sample at Pilot Test 1A (0.6 ug/100cm^2).

In general, the results indicated the following:

- Pilot Tests 1A and 1B were most successful at encapsulating residual concentrations of PCBs in concrete while using the most desirable of the products tested. Each of these tests implemented Sikagard 62 epoxy in the joint and Sikagard 670W clear on the adjacent concrete. This product combination was tested at both a horizontal and a vertical joint, and was notably successful from an effort standpoint due to:
  - The lack of a need to mechanically grind inside the joint (both these locations were knife-cleaned)
  - The lack of a need to apply epoxy to the concrete face within 0.5" of the joint to contain the highest residual PCB concentrations outside of the joint (the 670W surface within 0.5" of the joint was non-detect for PCBs).
- Pilot Tests 2A and 2B were comparatively unsuccessful as the EnviroSeal 20 product proved difficult to implement, and results at location 2A were reported with higher PCB concentrations than any other location.
  - The potential exists for there to have been higher PCB concentrations in the concrete at location 2A, as the Sikagard 62 wipe samples from inside the joint and within 0.5" of the joint were also reported with higher concentrations than at any other pilot test location.
- Pilot Tests 2C and 4 were comparatively successful, but resulted in a colored concrete surface that was difficult to match to natural concrete and may not be aesthetically desirable.

- Pilot Test 3 was comparatively successful, but results in a two-inch wide silicone strip over the joint that may not be aesthetically desirable or warranted.
- Knife-cleaning only (i.e., no mechanical grinding) is the preferred method to prepare the surface of a joint given the following:
    - Upon comparing data of a hand-cleaned joint to a mechanically ground joint, no differences were seen in the wipe sample results from within the joint or from concrete adjacent to the joint.
    - Despite best efforts to control dust generation when grinding certain joints (i.e., using HEPA-vacuum equipped tools), visible dust traveled easily in the vacant joint and could be seen in the immediate work area during grinding. Grinding the joints as a surface preparation measure would require setting up additional controls/enclosures to control concrete dust.
- Follow-up adhesion testing indicated that the bonds between the epoxy and concrete were sufficient at all locations subject to testing (Pilot Test 2A, a joint cleaned by grinding; and Pilot Test 1B, a joint cleaned only with hand tools). While the epoxy-concrete bond was better in the joint that underwent mechanical grinding (2A), the epoxy-concrete bond at knife-cleaned location (1B) also met adhesion criteria. To maximize the potential for good adhesion at the epoxy-concrete bond, additional tests were performed to determine the best methods to prepare the concrete inside the joints (see Section 3.1.4 below).
- Follow-up tests conducted to test the adhesion of the caulking to the epoxy found that the caulking met criteria for an adequate bond to the epoxy. Adhesion tests were conducted at all Pilot Test locations with the exception of Pilot Test 3, where the caulking was beneath a silicone strip.

3.1.3 Initial Pilot Test Conclusions

Using these results as well as general observations during and after implementation, the outcome of each pilot test was ranked based upon its effectiveness (verification wipe sample laboratory results), implementability (ease of preparation and application), and aesthetics. This evaluation is presented as Table 3-2.

Pilot Tests 1A and 1B each implemented Sikagard 62 epoxy in the joint and Sikagard 670W clear on the adjacent concrete, and were successful at encapsulating PCBs (i.e., analytical results reported at non-detect) at each of the specified intervals at both horizontal and vertical joints. As such, full-scale implementation of this product combination (Sikagard 62 epoxy within the joint, and Sikagard 670W clear on adjacent concrete in the 0-0.5 inch and more distant intervals) is recommended for its effectiveness, implementability, and aesthetics.

Photo: A close-up of Pilot Test 1A prior to caulking installation. The epoxy is in the vacant joint, and the 670W is applied to the concrete beneath the joint only.

3.1.4 Additional Pilot Test Activities

After the initial round of pilot testing was completed as described above, additional tests were conducted on select portions of concrete that were removed from the wall at the vertical joint beneath Pilot Test 2B. The caulking was cleaned from this portion of the joint using a combination of hand tools and a caulking removal gun. The concrete was divided into three segments and coated using three combinations of encapsulating products. The first segment was coated with two coats of Sikagard 62 epoxy (similar to the in-place pilot tests), the second segment was coated with one coat of Sikadur 35 epoxy followed by one coat of Sikagard 62 epoxy, and the third segment was coated with two coats of Sikadur 35 epoxy. The Sikadur 35 epoxy, a high-strength low-viscosity epoxy, was tested to determine whether this product could be used in place of or in combination with the Sikagard 62 for several reasons:

- The higher viscosity of Sikagard 62 makes implementation more difficult than a lower-viscosity product;
- The Sikadur 35 is aesthetically more preferable because it is a clearcoat; any amount of epoxy that may be visible at the edges of the joint beneath the new caulking to be applied would not be noticeable; and
- It was desired to conduct adhesion testing of the Sikadur 35 to determine whether the bonds formed by this product would be better than the bonds formed by Sikagard 62.

Surface wipe samples were collected from each of the three coated surfaces to determine the products' effectiveness at encapsulating residual concentrations of PCBs. The results of all three samples were reported as non-detect for PCBs, as no PCBs were detected above the laboratory's minimum reporting limit of 0.5 ug/100cm^2.

Adhesion test results from the three coated surfaces found that the epoxy-concrete bond met criteria for each product combination. All adhesion tests conducted to date have met adhesion criteria for all products tested (Sikagard 62 and Sikadur 35) regardless of the joint preparation method (knife cleaning only, knife cleaning and caulking removal gun, and mechanical grinding).

3.2 BUILDING D PILOT TEST - BALCONY

Surface wipe samples were collected from three locations on a Building D balcony (Unit 05-09) to test the material used to coat all Building D balconies during a previous site renovation project in 2007. These samples were used to assess the effectiveness (with regard to PCB encapsulation) of a similar type of balcony coating system that is proposed to be installed during the exterior façade repair project on all buildings.

The sample locations included two random locations of the balcony surface and one location at the joint of the wall panel to the balcony slab. The wipe sample at the joint was *not* collected from caulking since the caulking was beneath a barrier, but rather was collected from the exterior surface of a flexible bridge material used to create a 45-degree angle between the horizontal balcony and the vertical wall.

The surface wipe samples collected from the two random locations were both reported as non-detect for PCBs. The wipe sample collected from the coated flexible bridge material spanning the caulking joint was reported with PCBs at 0.6 ug/100cm^2, indicating that the combination of materials currently serves as an effective barrier to encapsulate residual concentrations of PCBs assuming Building D balconies are similar in construction to the Building A balconies.

4. DATA USABILITY ASSESSMENT

This data quality and data usability assessment has been conducted to review the 354 primary samples collected to date in support of the characterization activities. This precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) evaluation includes an assessment of those parameters as well as quality assurance / quality control (QA/QC) samples as they affect the usability of sample results. These indicators have been examined in the context of the intended use of the data, and an overall assessment of site conditions.

Data validation and review was conducted both by W&C and by a third-party validator, Data Check, Inc. of New Durham, New Hampshire, according to a modified Tier II validation procedure. This review included a completeness check of field documentation including sample collection and preservation methods, a completeness check of the laboratory data and documentation, a review of the internal laboratory QA/QC procedures and results including surrogate recoveries, matrix spike and matrix spike duplicate results, blank results, and laboratory control standard results, and an evaluation of sample holding times, trip blank results, and field duplicate results. The assessment was performed in general conformance with USEPA Region I Guidelines and the Quality Control Guidelines for the Acquisition. Data Check's data validation summaries are provided with the laboratory analytical reports in Appendix D.

All bulk and surface wipe samples received by Analytics Environmental Laboratory of Portsmouth, New Hampshire were extracted by USEPA Method 3540C (Soxhlet Extraction) and analyzed for PCBs by USEPA Method 8082. All air samples were received by Alpha Analytical Laboratory of Mansfield, Massachusetts for PCB analysis in accordance with USEPA Compendium Method TO-10A guidelines.

4.1 PRECISION

Field duplicate samples were collected at an approximate frequency of one duplicate sample per twenty primary samples during the characterization sampling activities, with the exception of pilot test sample collection and isolated sampling events of one or two samples per mobilization. A total of eleven duplicate samples have been collected to analyze the precision of the primary sample results. Relative percent differences (RPDs) between the primary and associated duplicate samples were within acceptance criteria (≤ 50% for solid matrices) for all but two of the sample pairs. Data qualifiers ("J" for detected results, "UJ" for non-detect results) were attached to the associated primary sample results to indicate that these concentrations are estimated. In addition, data also was qualified if the RPD between the column results was outside of the acceptance criteria (≤25%); column results typically differ in solid matrices due to heterogeneities inherent to the sample matrix. Whether or not the RPD meets acceptance criteria, the laboratory reports the higher of the two column results. All qualifiers applied to the data are included in the summary tables provided with this report.

4.2 ACCURACY

Accuracy of the analytical data was assessed by reviewing recoveries for matrix spikes (MS), matrix spike duplicates (MSD), surrogates, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD). After review of this information, no qualifications were applied to the data as a result of MS/MSD, or LCS/LCSD percent recoveries. However, surrogate recoveries of decachlorobiphenyl were occasionally reported outside of acceptance criteria due to high PCB concentrations or interferences in the sample matrix. Samples reported with surrogate recoveries outside of acceptance criteria were qualified as estimate ("J") as indicated in the summary tables provided with this report.

4.3 REPRESENTATIVENESS

Consistent procedures and laboratory analysis of the data were achieved. Sample containers were packed on ice and were accompanied by complete chain of custody forms from the time of sample collection until laboratory delivery. No analytes were detected in the laboratory method blank analyses, indicating that there were no interferences introduced at the laboratory during sample analysis.

Most samples were extracted and analyzed within the recommended 14-day holding time for the extraction method. However, some samples were extracted after the 14-day time period as indicated by the data validation summaries. Although these data points are qualified as estimated ("J" or "UJ"), the data is still considered usable for its intended purpose given that the samples were kept under custody on ice at the laboratory until the time of their extraction.

Field equipment blank samples, collected at an approximate frequency of one per twenty primary samples during this sampling event, were non-detect for all samples; no qualifications were applied to the data.

4.4 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of valid data expected. The data packages from Analytics were reviewed to ensure that all sample and associated quality assurance results were available. Results of the completeness review indicated that all collected samples were analyzed and all quality control results were available to complete the data validation process.

4.5 COMPARABILITY

Comparability measures the degree of confidence with which one data set can be compared to a related set of data. Based on a review of established standard methods and procedures for collection, analysis, and reporting of data, the data collected by W&C during this sampling event are considered to have met the requirements for comparability.

4.6 SENSITIVITY

Sensitivity was evaluated based on a review of the sample quantitation and reported quantitation limits. Laboratory reported detection limits typically met the site data quality objective (reporting limit ≤ 1 ppm for bulk samples and < 0.5 μg/100 cm^2 for wipe samples), but sample dilutions did not make it possible to meet this objective for many of the characterization samples due to elevated PCB concentrations in these samples. In each instance where a sample was reported with an elevated detection limit, the reported concentration was indicative of PCB Remediation Waste or Bulk Product Waste, and the sample was included in the scope of this remediation plan. As such, those samples reported with elevated detection limits do not affect the overall quality of the data given that the data provided the information needed to develop the remediation plan.

4.7 CONCLUSION

Based on a review of the analytical results with regard to the PARCCS parameters, this data quality / data usability assessment indicates that the characterization data is of sufficient quality for use in developing the conceptual site model described herein and for use to in developing the remediation plan presented in Section 5.

5. REMEDIATION PLAN

This plan has been developed for the remediation of PCB-affected media at Building A of Peabody Terrace. Throughout the implementation process and upon its completion, each step of the remediation will be evaluated to determine whether any plan modifications should be made prior to remedy implementation at other site buildings. A general overview of the proposed remedial activities is presented in Section 5.1, and a detailed description of the approach for each of the affected media is presented in Section 5.2.

5.1 REMEDIATION OVERVIEW

The remediation plan proposed herein is a risk-based request prepared in accordance with 40 CFR Part 761.61(c). While all caulking and soils containing PCBs > 1 ppm will be removed for off-site disposal, the majority of the PCB-impacted concrete will remain in-place and be encapsulated with a protective coating. The on-site encapsulation of PCB remediation waste is an interim solution designed to shield impacted building materials from the effects of weathering and leaching mechanisms, thereby eliminating potential exposure pathways and mitigating the potential for PCB transfer via direct contact and/or leaching to other media/materials. Accordingly, there will be no resultant exposure to PCBs in the contained concrete, resulting in conditions protective of human health and the environment. This approach is considered an interim measure, which was considered to be preferable over a concrete removal option given the structural and waterproofing concerns as well as the architectural significance of the buildings. Proper disposal of any remaining PCB remediation waste will be required upon removal of the material or at the time of building demolition.

The remediation plan consists of an exposure pathway elimination approach that will minimize the level of disruption to tenants and allow the families to stay within the apartment units during the remediation work. The proposed sequence of remediation activities will include the following:

- Removal and off-site disposal of all exterior caulking, including:
    - Original caulking (PCB bulk product waste) – 4,200 linear feet of double bead panel & column caulking:
        - Horizontal and vertical joints between façade panels and columns;
        - Upper-floor balcony slab joints;
    - Replacement caulking (PCB remediation waste) – 2,800 linear feet of caulking, replaced in 1990's:
        - Window and door joints;
        - Ground-floor patio slab joints.
- On-site encapsulation of exterior concrete in direct contact with caulking
    - Encapsulate with two coats of a liquid epoxy, such as Sikagard 62 or equivalent.
- Surficial cleaning of metal window & door frames in direct contact with caulking:
    - The metal window & door frames will be subject to surficial cleaning after caulking removal; extent of cleaning to be verified by visual inspections and surface wipe samples.
- Application of replacement caulking within encapsulated joints (Sikaflex 2C, or equivalent).
- Conduct façade repairs as needed (concrete removal and replacement in deteriorated areas).
- Power washing of the exterior concrete façade following new caulking application.

- Encapsulation of exterior concrete not in direct contact with caulking (two coats of an acrylic coating, such as Sikagard 670W or equivalent)
    - High-occupancy areas (ground floor exterior walls, balcony/patio vertical surfaces) – remediation of surfaces with PCBs > 1 ppm (extent is limited to concrete within 1.5 inches of vertical panel joints and within 12 inches of horizontal panel joints).
    - Low-occupancy areas (exterior walls at 2nd floor level and higher; no balcony access) – remediation of surfaces with PCBs > 25 ppm (extent is limited to concrete within 0.5 inches of vertical and horizontal joints).
    - NOTE: As part of discussions regarding the integration of the PCB remediation to the overall exterior façade repair project, it has been decided by the project team to apply the clear acrylic protective coating (e.g., Sikagard 670W or equivalent) to all exposed exterior concrete surfaces. Additional corrosion inhibitor coatings/systems are also under review at this time.
- On-site encapsulation of balconies – horizontal concrete surfaces not in direct contact with caulking:
    - Given PCBs > 1 ppm and limitations to removal, the surfaces will be encapsulated with a liquid balcony coating system designed for weatherproofing, such as BASF Sonoguard, or equivalent.
- Remediation of ground level surfaces:
    - Concrete patios – although all data indicates these surfaces meet the high-occupancy cleanup level of 1 ppm, they will be coated with the same product used on the vertical surfaces (clear acrylic coating, such as Sikagard 670W) for weatherproofing and consistency purposes.
    - Building common entryway concrete pads– characterization data meets high-occupancy cleanup level; no remediation proposed.
    - Asphalt – characterization data meets high-occupancy cleanup level; no remediation proposed.
    - Brick – characterization data meets high-occupancy cleanup level; no remediation proposed.
    - Soil (grass-covered, mulch-covered, stone-covered)
        - Initial data indicates several locations with PCBs > 1ppm, with highest concentrations nearest the building.
        - All soils with PCBs > 1 ppm will be excavated for off-site disposal.
- Removal of interior window & door caulking
    - Interior caulking will be removed and replaced with new caulking. Following replacement, a metal trim or a flexible strip will be installed over the new caulking to prevent future direct contact with this material.
- Record deed notice, as required
- Ongoing monitoring and maintenance of encapsulated areas.

In addition to descriptions of the proposed remediation activities outlined above, the following sections provides details on the proposed site preparations and controls, perimeter air monitoring, verification sampling plans, waste storage and disposal, site restoration, and recordkeeping requirements. The activities are presented in the order of the proposed implementation sequence. Throughout implementation and upon remedy completion, the approach will be re-evaluated to determine whether any plan modifications should be made prior to remedy implementation at other buildings.

5.2 SITE PREPARATION AND CONTROLS

Prior to initiating any of the remediation activities, the following controls will be implemented:

- The Health & Safety Plan developed specific to the characterization activities will be reviewed and revised, as needed. All workers will follow applicable Federal and State regulations regarding the work activities, including but not limited to OSHA regulations, fall protection standards, respiratory protection, ladder/scaffolding safety, personal protective equipment, etc.
- Additional notifications and plans required for the work activities will also be prepared and submitted for approval, as needed.
- Access to the active work areas will be restricted by fencing with controlled access points.
- Prior to initiation and periodically during the work activities, project-related communications with building tenants and employees will be undertaken as described in Section 6. These communications may include schedule updates regarding disruption to particular areas, restrictions on exterior window or door use, or significant project updates.
- Access to the removal areas will be by temporary staging and/or mechanical lifts, as needed. All caulking removal areas will be contained using polyethylene sheeting or equivalent to control any blowing dust or debris generated from the activities. Wet wiping and water misting will be used as a dust suppressant as appropriate. Given that only hand tools will be used for the caulking removal and no caulking and only limited concrete grinding will occur, anticipated dust generation is minimal.
- Ground cover (polyethylene sheeting or equivalent) will be placed along the building walls to serve as a containment for any debris or building materials removed during façade work on ground floors.
- Given the presence of PCBs in surface soils, controls will be implemented such that impacted soils are not transported to non-impacted ground surfaces (e.g., pavement) by traffic (vehicular, equipment, foot, or otherwise).
- Ambient air monitoring within the support work zone and perimeter to this zone will be conducted during active caulking removal and soil excavation activities. To reduce particulate levels and exposures to airborne particulates, a combination of engineering controls (e.g., work zone enclosures, wetting, etc.) and personal protective equipment (PPE) will be implemented as part of the work activities. A perimeter air monitoring plan and sample log sheet is provided in Appendix E.

5.3 CAULKING REMOVAL

The caulking removal task described in this section includes the removal and off-site disposal of the exterior caulking at Building A, which consists of approximately 4,200 linear feet of double bead panel & column caulking (PCB bulk product waste) and approximately 2,800 linear feet of replacement window & door caulking (PCB remediation waste). The details of this task are outlined below.

- Surface preparation for caulking removal will include surficial wetting of visibly dry and/or deteriorating caulking to minimize dust generation.
- All exterior caulking will be removed using hand tools to achieve caulking removal to the maximum extent practicable while minimizing dust or other airborne particulates generated from caulking or adjacent building materials. This will *not* include mechanical grinding / sawcutting any adjacent concrete.
- Perimeter air monitoring will be conducted throughout caulking removal activities (Appendix E).

- Upon the completion of the initial removal activities, the joints will be visually inspected for the presence of any residual caulking. If residual caulking is observed, it will be removed from the adjacent material to the maximum extent practicable.
- Wet wiping and/or vacuuming of all tools and equipment in the work area will be performed at the completion of the work activity.
- Any debris collected within the polyethylene containment areas or on ground cover sheeting will be gathered and placed in the appropriate containers at the end of each work day. After use, disposable PPE and poly sheeting used to collect debris will placed in the appropriate containers for disposal as PCB remediation waste.
- All removed caulking and associated debris will be transported for off-site disposal in accordance with 40 CFR 761 Subpart D requirements (refer to Section 5.13).

New caulking will be installed after cleaning and encapsulation of the joint as described in the following sections.

5.4 MATERIALS IN DIRECT CONTACT WITH CAULKING

5.4.1 Concrete in Direct Contact with Caulking

As described in Section 2, the characterization data for concrete in direct contact with caulking shows that this material contains PCBs > 1 ppm. Because the physical removal of PCBs to ≤ 1 ppm in concrete in direct contact with the caulking is infeasible given structural and waterproofing concerns, aesthetic and architectural concerns, and the anticipated disturbance to tenants within the occupied building, a risk-based remedial approach has been developed. The proposed remedial technique for concrete in direct contact with caulking is encapsulation with two coats of a liquid epoxy, such as Sikagard 62 or equivalent.

The concrete in direct contact with caulking is present at the following locations:

- Exterior façade panels & columns (concrete to concrete joints)
  - Direct contact concrete material exists within horizontal joints above and below each floor slab, within vertical joints between concrete panels and columns, and within short vertical seams beneath patio/balcony windows and doors.
  - Exists along all 4,200 feet of the concrete to concrete joints
    - Joint depths range from 1-2 inches into building
    - Direct contact concrete present on both interior returns of the joint (4,200 x 2 = 8,400 ft)
- Balcony horizontal seams (concrete to concrete joints)
  - Direct contact concrete material exists at the edge of upper floor balconies where the horizontal concrete balcony slab meets the vertical wall
  - Linear footage is counted within the 4,200 feet of the concrete to concrete joints listed above

Concrete in direct contact with caulking is also present at window and door joints; while no analytical data could be collected to confirm PCB concentrations in this underlying concrete material, it is included in the scope of this remediation work, assuming that the concentrations are comparable to exterior panel & column direct contact concrete.

- Windows & doors (concrete to metal joints)
  - Direct contact concrete material exists within horizontal and vertical window and door joints
  - Exists along all 2,800 feet of the concrete to metal (window / door) joints
    - Joint depths range from 1-2 inches into building
    - Direct contact concrete present on a single interior return (the second interior return consists of a metal window/door frame)

Concrete in direct contact with caulking is also present at ground level patio slab joints; while analytical data confirmed that PCB concentrations in the horizontal patio slab were < 1 ppm, the bulk caulking concentrations and presumably the direct contact concrete on the vertical wall side of the joint are > 1 ppm. As such, these joints are included in the scope of this remediation work:

- Patios (concrete to concrete joints)
  - Direct contact concrete material exists at the edge of the ground level patio horizontal concrete pads where the horizontal surface meets the vertical wall
  - Exists along 110 feet of the concrete to concrete patio ground level concrete joints

Surface preparation for the selected remedial action includes a visual verification of caulking removal as described in the previous section; no physical removal or chemical decontamination of the concrete will be conducted. After this inspection step, baseline bulk concrete samples will be collected from representative locations to document the baseline (existing) PCB concentrations that remain beneath the encapsulant. The proposed baseline sampling frequency is based on the four different types of masonry joints that exist at Building A, as described above. A total of 18 baseline concrete samples will be collected from the following joints:

- Concrete to concrete panel/column joints (2 per façade; 8 total).
- Concrete to metal window and door joints (2 per east and west façades; 1 per north and south facades; 6 total).
- Concrete to concrete balcony joints (2 per façade; 2 total; balconies are located on the west façade only).
- Concrete to concrete patio joints (2 per façade; 2 total; patios are located on the west façade only).

In some cases, the characterization data collected in 2009 will be carried forward to use as baseline data. For example, direct contact concrete to concrete panel joints have already been sampled at one location on the west façade, at two locations on the north façade, and at one location on the east façade. As such, the proposed frequency listed above (2 samples per façade; 8 samples total) will be reduced to collecting four new samples: one sample on the west façade, one sample on the east façade, and two samples on the south façade.

Concrete samples will be collected in accordance with the USEPA Region I Draft Standard Operating Procedure for Sampling Concrete in the Field (December 1997). The specific sample locations will be randomly selected, using a random number generator to select the unit and the length along the joint for sample collection; however, all samples will be located on ground-floor elevations given this level's higher potential for direct contact exposures. Duplicate samples and field equipment blanks will be collected at a frequency of one per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with the sample collection.

After baseline concrete sampling, the concrete in direct contact with the former caulking (i.e., within the joints) will be encapsulated with two coats of a protective, epoxy coating, such as Sikagard 62, Sikadur 35, or equivalent. Sikagard

62 has been used to successfully encapsulate residual concentrations of PCBs at similar remediation sites and both Sikagard 62 and Sikadur 35 were used during the pilot tests at Building A. The product technical specifications for these products are provided in Appendix F. After caulking removal in the pilot test application, the inner returns (sides) of the joint were coated evenly with two layers of epoxy, and the back of the joint was coated with two layers of epoxy to the maximum extent practicable given its varied and/or uneven surface. Given the analytical results from the wipe samples within the coated joints, it appears that the methods employed during the pilot test were sufficient to contain residual concentrations of PCBs within the joint.

After epoxy encapsulation, baseline surface wipe samples will be collected from the same locations as the baseline bulk concrete samples to evaluate the effectiveness of the encapsulation and establish a baseline for future monitoring. As described above, this will include sample collection from a total of 18 locations. Wipe samples will be collected using hexane-saturated gauze wipes in accordance with the standard wipe test method (40 CFR 761.123). Duplicate samples and field equipment blanks will be collected at a frequency of 1 per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with sample collection.

Analytical results from the wipe samples of the epoxy will be evaluated to determine whether or not this task is complete as follows:

- Analytical results ≤1 µg/100 cm^2 – task complete and new caulking can be applied.
- Analytical results >1 µg/100 cm^2 – additional application of epoxy is required, and additional verification wipe samples to be collected at an off-set location.

5.4.2 Metal in Direct Contact with Caulking

The metal window and door frames within the Building A façade are each sealed to the adjacent concrete with a bead of white caulking, installed as replacement material in the 1990s. After caulking removal, the proposed remedial technique for the 2,800 linear feet of metal frames in direct contact with the former caulking is surficial cleaning using hand tools followed by cleaning with a citrus-based solvent product. No grinding, sawcutting, or physical removal of the window/door frames will be conducted.

After a visual verification of caulking removal and surficial cleaning, verification surface wipe samples will be collected from representative locations to verify that the surface preparation is complete. Analytical results from the wipe samples of the metal surfaces will be evaluated to determine whether or not caulking removal was complete as follows:

- Analytical results ≤10 µg/100 cm^2 – caulking removal complete and now caulking can be applied.
- Analytical results >10 µg/100 cm^2 – additional cleaning of metal frames required, and additional verification wipe samples to be collected at an off-set location.

The proposed verification sampling frequency is to collect 1 sample from every 10 windows/doors (approximately 1 sample per 250 linear feet) for a total of 11 primary verification wipe samples. This frequency corresponds to collecting 5 wipe samples from each of the east and west sides of Building A and 1 sample from the north and south ends combined (only two windows are present on either end). The specific locations will be randomly selected, using a random number generator to select the window/door unit and the length along the joint for sample collection.

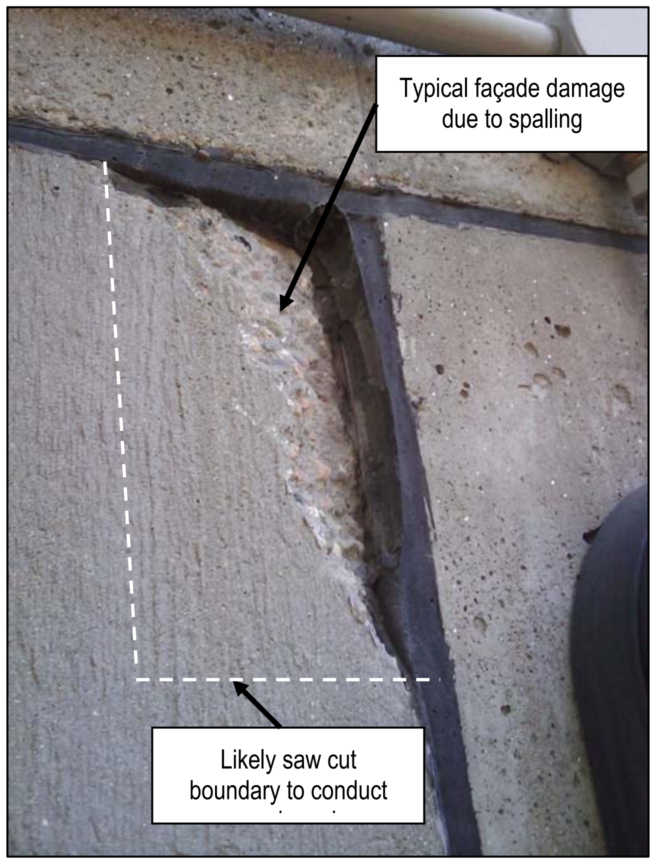
Wipe samples will be collected using hexane-saturated gauze wipes in accordance with the standard wipe test method (40 CFR 761.123). Duplicate samples and field equipment blanks will be collected at a frequency of 1 per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with sample collection.

Following wipe testing and achievement of the cleanup levels indicated above, new caulking will be applied to seal the joint.

5.5 NEW CAULKING APPLICATION

After completing each of the preparation steps as outlined above (caulking removal, surface preparation of concrete and/or metal joints, epoxy application, and sampling), the joints will be restored by sealing the joint with a new foam backer (as necessary) and new caulking. The product likely to be used is Sikaflex 2C, a two-component, non-sag, polyurethane-based, elastomeric caulking suitable for horizontal and vertical joints. This product was effectively used on the building in pilot test application as described in Section 3. A technical specification is provided in Appendix F.

5.6 CONCRETE REPAIRS



A primary focus of the façade renovation project is to repair/treat exterior concrete surfaces to prevent further deterioration. In support of this objective, some areas of the façade with extensive spalling (concrete weathering, rebar corrosion, and general deterioration – see photo at right) will require repairs prior to applying any surficial coatings. Façade repairs will generally consist of:

- Sawcutting around sections of damaged concrete to achieve a repair surface bounded by smooth and straight edges;
- Chipping out the block of cut concrete;
- Grinding out and replacing corroded rebar as needed; and
- Patching the surface with new concrete.

If the repairs are conducted on a section of concrete known to contain PCBs > 1 ppm (within 2 inches of a vertical joint or within 12 inches of a horizontal joint), engineering controls will be implemented such that any dust generated and debris removed from the façade will be contained and properly managed. These controls will involve working within polyethylene containments, using tools equipped with HEPA-filters, wearing proper PPE (full-face respirators and Tyvek suits) within the containment, and transferring all collected dust and debris into containers designated for the disposal of PCB remediation waste. These controls will be the same as those implemented for concrete repair work conducted at locations with PCBs < 1 ppm (greater than 2 inches from any vertical joint and greater than 12 inches from any horizontal joint); however, the disposal of concrete dust and debris collected from these locations is not restricted under 40 CFR 761 as it does not contain PCBs > 1 ppm. All PCB wastes will be disposed of in accordance with the description provided in Section 5.13.

5.7 FAÇADE POWER WASHING

All exterior concrete surfaces will be power washed following installation and curing of the new caulking. This step is necessary to prepare the concrete façade for the surface coating to be applied.

Although the former caulking will have been removed from the building at the time of façade power washing, the PCB-impacted concrete not in direct contact with caulking will be exposed and subject to power washing. Given the low levels of PCBs detected in this concrete (up to 130 ppm nearest the concrete joint, but decreasing in concentration to < 1 ppm within 1.5 inches of vertical joints and within 12 inches of horizontal joints), it is anticipated that some amount of PCBs may be transferred from the concrete to the wash water during power washing activities.

Initially, a water containment system will be set up on-site in order to collect and containerize water generated from power washing the façade. This containment system may consist of a combination of polyethylene enclosures around staging or lifts, impermeable barriers on the ground surface, submersible pumps, and temporary on-site storage tank(s). It is estimated that up to 2,500 gallons of water may be collected during power washing, depending on the flow rate and façade coverage rate.

After the water is collected, it will be sampled for laboratory analysis of PCBs with a minimum detection limit of 0.5 ug/L. On-site water treatment may be considered after an assessment of the analytical data and the available disposal options. Ultimately, the collected water will be managed in accordance with applicable regulations as determined by the analytical data.

Depending on the initial sample results from the contained water, modifications to this plan may be proposed, such as eliminating the containment process if PCBs are not detected in the wash water. At that point, the water will be allowed to drain at the base of the building. As noted previously, at the completion of the façade work, soils adjacent to the building containing PCBs > 1 ppm will be excavated and transported off-site for disposal.

5.8 VERTICAL CONCRETE SURFACES NOT IN DIRECT CONTACT WITH CAULKING

As described in Section 2, certain vertical concrete surfaces not in direct contact with caulking materials have been impacted by PCBs to levels > 1 ppm and will require remedial actions. Given structural and aesthetic concerns as well as the potential to disturb tenants, no physical removal or chemical decontamination of the concrete will be conducted. The PCBs present in this material will be encapsulated in place to achieve a barrier such that exposure to residual PCBs is eliminated at the surface. The concrete requiring remedial actions, measuring approximately 8,000 square feet (vertical surfaces only, less windows and doors), is present at the following Building A locations:

- Concrete panels & columns – horizontal joints
  - The areas identified for cleanup extend to a maximum distance of 12 inches below a horizontal joint, and to a distance of 12 inches above a horizontal joint; PCBs decrease to levels below 1 ppm between 3 and 12 inches from the joint.
- Concrete panels & columns – vertical joints
  - The areas identified for cleanup extend to a maximum distance of 1.5 inches laterally beside a vertical joint; PCBs decrease below 1 ppm after 1.5 inches distance from joint.

As part of discussions regarding the integration of the PCB remediation to the overall exterior façade repair project, it has been decided by the project team to apply a clear acrylic protective coating (e.g., Sikagard 670W or equivalent) to all exposed exterior concrete surfaces. Additional corrosion inhibitor coatings/systems are also under review at this time. The product technical specification for Sikagard 670W is provided in Appendix F.

Prior to application of the acrylic coating, the concrete surfaces will be sampled to collect baseline bulk concrete data. Samples will be collected from representative locations to document the baseline (existing) PCB concentrations that remain beneath the encapsulant. Concrete samples will be collected in accordance with the USEPA Region I Draft Standard Operating Procedure for Sampling Concrete in the Field (December 1997). The proposed baseline sampling plan is to collect two samples per the east and west façades and one sample per the north and south facades, for a total of six baseline concrete samples not in direct contact with caulking. The specific locations will be selected using a random number generator to select the unit, but will be biased to sample the concrete within three inches of a caulked joint given the known higher concentrations, and at ground-floor or balcony elevations given the higher potential for direct contact exposures at these locations. In some cases, the characterization data collected in 2009 will be carried forward to use as baseline data. For example, indirect contact concrete locations have already been sampled at one location on each of the west, north, and east façades. As such, the proposed frequency listed above (6 samples total) will be reduced to collecting three new samples: one sample on each of the west, east, and south façades. Duplicate samples and field equipment blanks will be collected at a frequency of 1 per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with the sample collection.

After sampling, the surfaces will be patched at sample locations and prepared so that they are dry, clean, and free of significant cracks or pitting. The Sikagard 670W coating, or equivalent, will be applied directly to the concrete to create a containment barrier encapsulating the residual PCBs in the concrete façade. Pilot test data from Building A demonstrated that applying two coats of the Sikagard 670W served as an effective barrier to PCBs in the concrete, as surface wipe data at four locations (two within 0.5 inches of a joint, and two within 0.5 and 3.0 inches of a joint) were all reported as non-detect for PCBs.

After Sikagard 670W encapsulation, baseline surface wipe samples will be collected from the same locations as the baseline bulk concrete samples to evaluate the effectiveness of the encapsulation and establish a baseline for future monitoring. As described above, this will include sample collection from a total of six locations. Wipe samples will be collected using hexane-saturated gauze wipes in accordance with the standard wipe test method (40 CFR 761.123). Duplicate samples and field equipment blanks will be collected at a frequency of 1 per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with sample collection.

Analytical results from the wipe samples of the acrylic coating will be evaluated to determine whether or not this task is complete as follows:

- Analytical results ≤1 µg/100 cm^2 – task complete.
- Analytical results >1 µg/100 cm^2 – additional application of the coating is required on the ground surface (east, south, and north facades) or balcony/patio areas (west façade), and additional verification wipe samples to be collected at an off-set location.

5.9 CONCRETE BALCONY AND PATIO SURFACES

Upper floor (2nd floor and higher) balcony surfaces not in direct contact with caulking have been shown to contain PCBs > 1 ppm. A concrete balcony exists outside each of the 20 upper floor units on the west façade of Building A. The horizontal concrete balcony surfaces are considered to consist only of the concrete slab extending beyond the building face as a continuation of the floor slab at each level: this *includes* the pad material (horizontal surface) in direct contact with and horizontally beyond the caulking joint, and *excludes* the wall material (vertical façade) in direct contact with and above the caulking joint (this vertical surface is included in the previous section discussion).

Given structural concerns as well as the potential to disturb tenants, no physical removal or chemical decontamination of the concrete balconies will be conducted. The PCBs present in this material will be encapsulated in place to achieve a barrier such that exposure to residual PCBs is eliminated at the surface.

Prior to application of the coatings, the concrete surfaces will be sampled to collect baseline bulk concrete data. Samples will be collected from representative locations to document the baseline (existing) PCB concentrations that remain beneath the encapsulant. Concrete samples will be collected in accordance with the USEPA Region I Draft Standard Operating Procedure for Sampling Concrete in the Field (December 1997). The proposed baseline sampling plan is to collect one sample from a random location on each of four additional balconies to supplement the existing balcony characterization data. This sampling frequency translates to one baseline sample for every 250 ft^2 of balcony surface. The specific locations will be randomly selected, using a random number generator to select the unit and the x-y coordinates. Duplicate samples and field equipment blanks will be collected at a frequency of 1 per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with the sample collection.

After sampling, the surfaces will be patched at sample locations and prepared so that they are dry, clean, and free of significant cracks or pitting. The coatings will be applied directly to the concrete to create a containment barrier encapsulating the residual PCBs in the concrete. The topside of each balcony will be primed and then encapsulated with two coats of BASF Sonoguard, a colored polyurethane liquid coating system that will also serve as a weatherproofing coating. The underside of each balcony, containing only residual concentrations of PCBs at locations nearest the joint at the building face, will be coated entirely with a separate breathable waterproof coating. The product technical specification for BASF Sonoguard is provided in Appendix F.

After encapsulation, baseline surface wipe samples will be collected from the same locations as the baseline bulk concrete samples to evaluate the effectiveness of the encapsulation and establish a baseline for future monitoring. As described above, this will include sample collection from a total of two locations. Wipe samples will be collected using hexane-saturated gauze wipes in accordance with the standard wipe test method (40 CFR 761.123). Duplicate samples and field equipment blanks will be collected at a frequency of 1 per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with sample collection.

Analytical results from the wipe samples of the balcony coating will be evaluated to determine whether or not this task is complete as follows:

- Analytical results ≤1 µg/100 cm^2 – task complete.
- Analytical results >1 µg/100 cm^2 – additional application of the coating is required and additional verification wipe samples to be collected at an off-set location.

As described previously, PCBs were not detected in the ground floor patio concrete samples in excess of 1 ppm. However, the caulking at the pad/building wall joint is planned to be removed with the application of an epoxy coating over the concrete in direct contact with the former caulking, followed by new caulking. For consistency with the waterproofing/concrete restoration project, the ground floor patio pads will be coated with the same acrylic coating used on the vertical surfaces of the building, Sikagard 670W, or equivalent. Given that no PCBs were detected above 1 ppm, baseline concrete or wipe samples will not be collected from the ground floor patios.

5.10 PAVED ADJACENT GROUND SURFACES

As presented in Section 2, characterization data indicates that paved ground surface coverings adjacent to Building A (asphalt, brick, and concrete, including ground-level patios on the west façade) do not contain PCBs > 1 ppm. As such, the high-occupancy cleanup level has been met and these surfaces do not require remediation. While no work will be conducted on adjacent asphalt and brick surfaces, ground surface concrete patio pads will be included in the overall façade project scope of work as it is desired to coat these surfaces with the same weatherproofing coating as will be used for the upper-floor balcony concrete pads (see previous section).

5.11 UNPAVED ADJACENT GROUND SURFACES (SOILS)

Unpaved ground surfaces adjacent to Building A consist of exposed soil, grass-covered soil, mulch-covered soil, or soil beneath filter fabric and landscaping stone. Initial characterization data indicates that some soils contain PCBs > 1 ppm, as depicted on Figure 2-2. All soils containing PCBs > 1 ppm are proposed to be excavated and transported for off-site disposal as PCB remediation waste. As described in Section 2.2.7, exposed surface soils with PCBs > 10 ppm at one location triggered a two-hour reporting condition under the MCP, resulting in the excavation of approximately 5 cubic yards of soil within 12 inches of ground surface from an area adjacent to the north face of Building A in November 2009. This removal was conducted as a 40 CFR 761.61(b) action, and the soil was transported to Chemical Waste Management's chemical waste landfill in Model City, NY for disposal.

As shown by the existing characterization data set, all soils collected within 3 inches of ground surface and 10 feet of Building A have been reported with PCBs > 1 ppm. The vertical extent of soil sampling has been limited to the upper three inches of ground surface with the exception of soils adjacent to the building beneath landscaping stone (4 locations) and soils at the base of the limited-volume soil excavation conducted to 12 inches bgs along the north face of Building A (4 locations). No soil samples have been collected along the south face of the building as this ground surface consists entirely of a brick walkway.

It is assumed that all exposed perimeter soils within 10 feet of the building and within the upper 12 inches of ground surface contain PCBs > 1 ppm and will be removed for off-site disposal. In order to supplement the existing soil characterization data set, additional delineation sampling will be conducted before a soil removal plan is prepared. Delineation sampling will be conducted following 40 CFR 761 Subpart N requirements or an alternate approved sampling plan. A soil characterization plan will be reviewed with EPA prior to collecting these additional samples. Conceptually, additional horizontal delineation samples will be collected at distances of 15 and/or 20 feet from the nearest building face. Vertical delineation samples will be collected at intervals from 12-15" bgs, 15-18" bgs, and 21-24" bgs as an initial step, and may be collected at deeper intervals if soils at 24" bgs contain PCBs > 1 ppm. These vertical delineation samples will be collected up to 24" bgs at locations adjacent to the building (within 1-2 feet), and will be collected to lesser depths with increasing distance from the building given the release pathway model.

In accordance with 40 CFR 761, the remediation goal is to remove contaminated soils and verify that remaining soil concentrations are ≤ 1 ppm. Unless potential imminent hazard conditions are discovered (accessible soils > 10 ppm), no soil remediation will be conducted until the adjacent building façade remediation has been completed.

Based on the characterization data collected to date, it is assumed removal of soils in known impacted areas to a minimum depth of 12 inches and a minimum distance of 10 feet from each building face will be required in areas around Building A. The actual limits of excavation will be determined before soil removal with additional characterization data, and will be confirmed by post-removal verification sampling data to demonstrate that the clean-up goals have been achieved. A plan depicting the proposed areas for soil removal, as well as the verification sampling approach, will be submitted to EPA prior to implementation.

As described in preceding sections, paved ground surfaces have been confirmed to contain PCBs < 1 ppm. Given the known PCB transport pathway, if these ground surfaces have been paved since the original building construction date, there would be no pathway for PCBs to have come to be located in the soils beneath the asphalt pavement or concrete. If this is the case, these soils would be considered to not be impacted by PCBs. If it cannot be confirmed that these surfaces have been paved since original building construction, post-excavation verification sampling will be conducted from the sidewalls of those areas beneath paved surfaces if adjacent unpaved soils were excavated to a point ending at a paved surface.

Further details regarding the pending soil remediation are provided below:

- Implement preparation and controls as described in Section 5.2.
- Prior to any work, the boundaries of the excavation area will be marked, properly secured, and a permit number obtained from Dig Safe.
- Conduct soil excavation activities using a backhoe excavator or equivalent in the areas to be identified. At the end of each work day, any open excavations will be secured by temporary fencing, steel plates, or other means to prevent entry into the open excavation.
- Excessive airborne dust will be prevented by using appropriate dust control measures (i.e., watering, misting the work areas), as needed. Perimeter air monitoring will be conducted during soil removal activities in accordance with the air monitoring plan provided in Appendix E.
- All excavated soil will be stored in lined, marked, and covered roll-offs or other approved containers in accordance with 40 CFR 761.60.
- Following completion of the initial soil excavation area, post-excavation samples will be collected in accordance with the approved verification sampling plan.
- All samples will be transported to the laboratory under standard Chain of Custody procedures, extracted using USEPA Method 3540C (Soxhlet extraction), and analyzed for PCBs using USEPA Method 8082.
- In addition to the primary samples indicated above, duplicate samples and field equipment blanks will be collected at a frequency of one per 20 samples and submitted to the laboratory as part of the QA/QC procedures associated with the sample collection procedures.
- Upon receipt of the analytical results and data validation, the data will be compared to the clean-up levels:
    - If ≤ 1 ppm, the clean-up will be considered complete;
    - If > 1 ppm, additional soil excavation activities will be performed in the respective grid areas and verification samples collected at the frequency indicated above using offset sampling locations. This process will be repeated until a cleanup level < 1 ppm is achieved.
- Restore site conditions (see Section 5.14).

5.12 INTERIOR CAULKING

PCBs at levels > 1 ppm have been detected in interior caulking and the inaccessible building materials beneath the caulking within Building A residential units. The smaller Building A units (e.g., Unit 18-12) contain two windows and one exterior door, for a estimated total 61 linear feet of interior caulking. Larger Building A units (e.g., Unit 22-11) contain three windows and one exterior door, for a estimated total 82 linear feet of interior caulking. This caulking appears to be the same as the white window caulking present on the building exterior that was installed in the 1990s during a window replacement project. The transport mechanism for PCBs to have come to be located in this interior caulking has been identified as PCB-impacted building materials within the walls (i.e., inaccessible surfaces beneath the caulking such as concrete that was in former contact with original PCB-containing caulking).

In consideration of available remedial options, complete removal of the impacted building materials beneath the caulking and integral to the building walls is infeasible given that the materials are structural and/or inaccessible without complete renovation of the interior units. Removal of the caulking and encapsulation of the underlying integral building materials is also an infeasible option – the underlying media could not be effectively coated given their variability and/or inaccessibility. Because substrate encapsulation is infeasible, a straightforward removal and replacement with new caulking could potentially lead to cross-contamination of that new caulking.

Given this information and based on discussions with EPA regarding the concentrations of PCBs in this caulking (up to 223 ppm), all interior window/door caulking will be removed and replaced with new caulking. Following replacement, a metal trim or a flexible strip will be installed over the new caulking to prevent future direct contact with this material.

As shown by the interior assessment (surface wipe and indoor air monitoring data – See Appendix A and Section 2), the presence of PCBs in the interior caulking does not pose an unacceptable risk to tenants. As such, the timing of the interior caulking remedial action will be performed at unit turnover in order to minimize the disturbance to tenants. Based on discussions with Harvard, the turnover of most units would occur within the three-year projected exterior façade project. For those units that fall outside of this timeframe, the actions will be coordinated to be conducted during occupancy. Implementation of the interior caulking remedial actions will run separately and independently of the exterior façade work.

5.13 STORAGE AND DISPOSAL

The following PCB wastes will be managed as a single waste stream and designated as > 50 ppm PCBs:

- All interior caulking
- All exterior caulking
- All concrete removed during façade repairs from areas containing PCBs > 1 ppm (within 12 inches of any horizontal joint or within 3 inches of any vertical joint)

Polyethylene sheeting, PPE, and non-liquid cleaning materials will be managed and disposed of off-site in accordance with 40 CFR 761.61(A)(5)(v).

The following activities will be completed with regard to the proper storage and disposal of PCB wastes:

- Secure, lined, and covered waste containers (roll-off containers or equivalent) or 55-gallon DOT-approved steel containers will be staged for the collection of PCB wastes generated during the work activities in accordance with 40 CFR 761.65;
- All containers will be properly labeled and marked in accordance with 40 CFR 761.40;
- Upon completion of the work or when a container is considered full, the waste will be transported off-site under manifest, for disposal at Chemical Waste Management's Chemical Services Facility located in Model City, New York, or equivalent TSCA waste disposal facility.
- Copies of all manifests, waste shipment records, and certificates of disposal will be collected and provided as part of the final report to EPA.

After façade work, the storage and management of soils containing PCBs > 1 ppm will be conducted following the same procedures as outlined above; however, the facility selected for disposal of the soils may be different from the facility listed above, depending on the in-place concentrations found after soil characterization activities are complete.

5.14 SITE RESTORATION

Following completion of the removal activities and verification that the cleanup levels have been met or the risk-based approach applied, the building surfaces will be restored or contained as described in the preceding sections. Any exposed concrete surfaces that were disturbed for sampling or other purposes will be patched with concrete repair materials. All soil excavation areas will be backfilled and compacted and the ground surface restored to its original condition (grass, wood chips, etc.).

The site controls will be dismantled and all wastes will be transported off-site for proper disposal.

5.15 RECORDKEEPING AND DOCUMENTATION

Following completion of the work activities, records and documents per 40 CFR Part 761 will be generated and maintained at one location. A final report documenting the completion of the work activities, verification analytical results, volumes of disposed materials, and waste disposal records will be prepared and submitted to EPA. This report will also include any necessary deed notices, if required, as part of the risk-based approach.

5.16 CONCEPTUAL MONITORING AND MAINTENANCE PLAN

As described in detail in previous sections of this plan, Harvard has proposed an alternate remedial plan under 40 CFR 761.61(c). This approach removes the source material and soils, and utilizes a physical barrier approach (epoxy coating in joints, acrylic clear coating on façades, polyurethane waterproofing coating on balconies, and new caulk installation) to eliminate the direct contact exposure pathway and migration pathways of PCBs remaining on the building. Upon completion of the remedial actions, the impacted concrete would not be accessible to direct exposure or migration to surrounding building materials.

Following the completion of the remediation activities described above, a monitoring and maintenance plan (MMP) will be developed and implemented. The main components of the plan are as follows:

- Semi-annual visual inspections – visual inspections of the encapsulated surfaces will be conducted on a semi-annual basis (Spring and Fall). All inspections will be recorded and included in the Annual Report to the EPA. The inspections will consist of an assessment of the following:
    - Signs of the underlying coating, or excessive pitting, peeling, or breakages in the coating;
    - Signs of weathering or disturbance of the replacement caulking; and
    - A general inspection of the encapsulated surfaces.
- Annual Wipe Sampling – each year surface wipe samples will be collected from the encapsulated surfaces. Wipe samples will be collected at the same frequency as the baseline sampling of encapsulated surfaces, as described above, for the vertical surfaces and balconies not in direct contact with the former caulking. Given that areas in former direct contact with the caulking will have since been covered with epoxy and new caulking, wipe samples will be collected based on a new sample frequency of one sample of the new caulking per building façade. Because the interior caulking will have been removed and the replacement caulking covered with a metal or similar non-liquid barrier, no additional wipe samples will be collected from interior caulking. Wipe samples will be collected following the standard wipe test procedures described in 40 CFR 761.123 and/or an alternate proposed method;
- Annual Reporting – a report documenting the findings of the visual inspections and wipe testing will be prepared and submitted to EPA;

- Corrective Actions – if results of the annual sampling indicate that PCB concentrations in excess of the established action levels are present on the surface of the encapsulated areas, corrective measures shall be taken. These measures may include additional monitoring and/or the additional application of the protective coating or barriers;
- Maintenance Guidelines and Procedures – to prevent potential exposure to maintenance and facility personnel, guidelines and procedures will be developed and implemented for any work being conducted in the respective encapsulated areas. These guidelines and procedures will detail communications procedures, worker protection requirements, and worker training requirements to be conducted for maintenance or other activities in these areas.

The details of the MMP will be developed following completion of the remedial activities described above. The results of the verification testing, baseline sampling, and inspections will be used to develop the details of the plan. The MMP will be provided to EPA under a separate submittal following the completion of the remedial activities.

6. COMMUNICATIONS

Upon learning of the presence of PCBs at the Peabody Terrace complex, Harvard undertook an awareness campaign and developed a communications procedure for sharing information with Peabody Terrace tenants, employees, contractors, and the daycare centers to inform those parties of the presence of PCBs at the Peabody Terrace housing complex.

A copy of the completed communication activities, communications team, and initial project update (October 14, 2009) is provided in Appendix G. These activities included meetings, fact sheets, drop-in sessions, and training for various stakeholders including building staff, daycare staff, parents, tenants, University departments, news office, and Cambridge officials.

Prior to initiation and periodically during the work activities, project-related communications with tenants and employees will be undertaken on an as-needed basis (i.e., notice of disruptive activities to particular areas) or as significant project milestones are achieved.

7. SCHEDULE

Remediation activities will be initiated immediately upon approval of this plan. Given that the proposed remediation activities will be conducted in continuous occupancy residential buildings and will involve a significant amount of disruption, the remediation will occur in a phased approach. The remediation work will focus initially on Building A, thereby allowing Harvard to evaluate the remedial activities and make adjustments or refine the approach based on information acquired during the activities completed at Building A. It is anticipated that the building materials remediation activities will be completed first followed by the soil removal at each respective building.

The intent for the overall exterior façade project is to complete activities by groups of buildings. At this time, the projected schedule for completing the work is as follows:

- 2010: Building A, followed by Buildings B, C, and X
- 2011: Buildings E, F, and Y
- 2012: Buildings D and Z

Given this schedule and based on EPA's review (and Approval) of the proposed work at Building A, the plan is to develop associated remediation plans (which will include building-specific characterization sampling) for the remaining buildings or groups of buildings and submit them for subsequent review (and Approval) by EPA.

Upon learning that Building A exterior caulking samples contained percent level concentrations of PCBs, Harvard began to collect a comprehensive set of characterization data to ensure that tenants and users of Peabody Terrace were not subject to unsafe conditions based on the presence of PCBs in the exterior caulking. Characterization sample collection was prioritized at the following locations: exterior locations with higher exposure potential and likely PCB transport pathways (i.e., designated play areas adjacent to buildings and lawns adjacent to ground-floor patios across the complex); on-site daycares and interior common rooms throughout the complex where it was likely that children may be present; and apartment unit interior surfaces and attached exterior patios and balconies (Building A only, at this time). As an initial step in the data evaluation process, action levels were developed using a combination of published regulatory information or derived using standard health risk-based approaches.

Although detectable levels of PCBs are present in samples collected from some exterior and interior caulking and, less frequently in adjacent materials (window frames, floors, concrete, soils, etc.), they are not likely to result in significant exposures or health risks in the time frames estimated to complete remediation of the caulking and associated impacted materials. Supporting information is presented in Appendix A.

To ensure that any potential risks are minimized during the intervening period, Harvard has implemented several interim stabilization control actions as described below:

- Barriers, such as new caulking and/or silicone strips, have been applied to exposed caulking, and an acrylic coating has been applied to exterior concrete walls, where designated play areas abut/include building façades;
- Geofabric and new mulch has been applied to soils in the play area with PCBs detected in soils over 1 ppm;
- Soils adjacent to Building A not under a surface covering (e.g., stone) and exhibiting concentrations > 10 ppm within 12 inches of the ground surface were excavated and removed from the Site; and
- Ground surface coverings adjacent to exterior building facades across the complex were refreshed (additional stone, etc.) and will continue to be inspected and refreshed as needed to maintain their covering.

Table 2-1
Exterior Bulk Caulking Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Original Caulking - PCB Bulk Product Waste					
Balcony Sealants					
15 - '05 26 09	West façade 1st floor patio area - vertical face beneath door above patio pad; gray caulking	05/26/09	131,000	4,950	J
16 - '05 26 09	West façade 1st floor patio area - vertical face beneath door above patio pad; gray caulking	05/26/09	70,400	4,917	J
PTA-CBK-2131-0337	West façade 21-31 balcony caulking at the pad to building face joint; dark gray original caulking	12/08/09	139,000	6.37	J
Panel Sealants					
01 - '05 26 09	North façade 1st floor panel; composite caulking all layers	05/26/09	60.1	2.28	J
03 - '05 26 09	North façade 2nd floor - panel; brown repair caulking	05/26/09	828	43.2	J
04 - '05 26 09	North façade 2nd floor - panel; black inner caulking	05/26/09	312	20.3	J
06 - '05 26 09	North façade 3rd floor - panel; black outer caulking	05/26/09	2,180	179	J
07 - '05 26 09	North façade 3rd floor - panel; black inner caulking	05/26/09	440	24.6	J
08 - '05 26 09	North façade 3rd floor - panel; black outer caulking	05/26/09	525	44.9	J
09 - '05 26 09	North façade 3rd floor - panel; black inner caulking	05/26/09	158	9.21	J
12 - '05 26 09	South façade 2nd floor - panel; brown repair caulking	05/26/09	8,150	309	J
13 - '05 26 09	South façade 2nd floor - panel; black inner caulking	05/26/09	872	48.5	J
Replacement Caulking - PCB Remediation Waste					
Window Caulking					
02 - '05 26 09	North façade 1st floor - white window caulking	05/26/09	17.5	2.61	J
05 - '05 26 09	North façade 2nd floor - white window caulking	05/26/09	57.7	3.33	J
Patio Sealants					
PTA-CBK-1812-0332	West façade 18-12 **patio** caulking at the pad to building face joint (ground level); light gray replacement caulking	12/08/09	27.8	1.52	J
PTA-CBK-2211-0341	West façade 18-12 **patio** caulking at the pad to building face joint (ground level); light gray replacement caulking	12/08/09	64.9	5.21	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. J = Value is estimated based on data validation.

Table 2-2
Exterior Bulk Concrete Characterization Data - Direct Contact with Caulking
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Façade Panel Joints					
PTA-CBC-2211-0223	2211 Panel, west face, 1st floor, direct contact sample (depth of joint), vertical orientation	10/22/09	228	13.1	
PTA-CBC-1821-0243	1821 Panel, center of north face, 2nd floor, vertical orientation	10/23/09	20.9	1.65	J
PTA-CBC-1821-0250	1821 Panel, center of north face, 2nd floor, horizontal orientation	10/23/09	69.1	3.3	J
PTA-CBC-1911-0295	1911 Panel, east face, first floor under ceiling slab, horizontal orientation	10/23/09	7.82	0.33	
Patio Joints					
PTA-CBC-2211-0227	2211 Patio, direct contact sample (depth of joint), horizontal orientation	10/22/09	0.34	0.033	
PTA-CBC-1812-0229	1812 Patio, direct contact sample (depth of joint), horizontal orientation	10/22/09	0.479	0.033	
Balcony Joint					
PTA-CBC-2131-0336	2131 balcony joint direct contact sample (depth of joint)	12/08/09	4,430	167	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. J = Value is estimated based on data validation.

Table 2-3
Exterior Bulk Concrete Characterization Data - Not in Direct Contact with Caulking
Peabody Terrace Remediation Plan

Sample ID	Sample Date	Joint Orientation	Distance From Joint (inches)	Sample Description	Total PCBs	Reporting Limit	Qualifier
Concrete Panels / Columns							
PTA-CBC-2211-0205	10/22/09	Vertical	0.0 - 0.5	2211 Panel, west face, 1st floor	130	12.3	
PTA-CBC-2211-0209	10/22/09	Vertical	0.5 - 1.0	2211 Panel, west face, 1st floor	5.14	0.300	
PTA-CBC-2211-0206	10/22/09	Vertical	1.0 - 1.5	2211 Panel, west face, 1st floor	1.05	0.063	
PTA-CBC-2211-0210	10/22/09	Vertical	1.5 - 2.0	2211 Panel, west face, 1st floor	0.267	0.033	J
PTA-CBC-2211-0207	10/22/09	Vertical	2.0 - 2.5	2211 Panel, west face, 1st floor	0.147	0.033	
PTA-CBC-2211-0211	10/22/09	Vertical	2.5 - 3.0	2211 Panel, west face, 1st floor	0.143	0.033	
PTA-CBC-2211-0213	10/22/09	Vertical	0.0 - 0.5	2211 Column, west face, 1st floor	132	6.53	
PTA-CBC-2211-0217	10/22/09	Vertical	0.5 - 1.0	2211 Column, west face, 1st floor	12.7	0.660	
PTA-CBC-2211-0214	10/22/09	Vertical	1.0 - 1.5	2211 Column, west face, 1st floor	1.31	0.063	
PTA-CBC-2211-0218	10/22/09	Vertical	1.5 - 2.0	2211 Column, west face, 1st floor	0.655	0.033	
PTA-CBC-2211-0215	10/22/09	Vertical	2.0 - 2.5	2211 Column, west face, 1st floor	0.379	0.033	
PTA-CBC-2211-0219	10/22/09	Vertical	2.5 - 3.0	2211 Column, west face, 1st floor	0.144	0.033	
PTA-CBC-1821-0244	10/23/09	Vertical	0.0 - 0.5	1821 panel, center of north face, 2nd floor	31.3	1.65	J
PTA-CBC-1821-0241	10/23/09	Vertical	0.5 - 1.0	1821 panel, center of north face, 2nd floor	2.44	0.160	J
PTA-CBC-1821-0245	10/23/09	Vertical	1.0 - 1.5	1821 panel, center of north face, 2nd floor	0.478	0.033	J
PTA-CBC-1821-0240	10/23/09	Vertical	1.5 - 2.0	1821 panel, center of north face, 2nd floor	0.074	0.033	J
PTA-CBC-1821-0246	10/23/09	Vertical	2.0 - 2.5	1821 panel, center of north face, 2nd floor	0.352	0.033	J
PTA-CBC-1821-0239	10/23/09	Vertical	2.5 - 3.0	1821 panel, center of north face, 2nd floor	0.568	0.033	J
PTA-CBC-1821-0251	10/23/09	Horizontal	0.0 - 0.5	1821 panel, center of north face, 2nd floor	93.4	3.37	J
PTA-CBC-1821-0260	10/23/09	Horizontal	0.5 - 1.0	1821 panel, center of north face, 2nd floor	2.79	0.160	J
PTA-CBC-1821-0261	10/23/09	Horizontal	1.0 - 1.5	1821 panel, center of north face, 2nd floor	4.31	0.330	J
PTA-CBC-1821-0262	10/23/09	Horizontal	1.5 - 2.0	1821 panel, center of north face, 2nd floor	1.80	0.170	J
PTA-CBC-1821-0263	10/23/09	Horizontal	2.0 - 2.5	1821 panel, center of north face, 2nd floor	1.82	0.160	J
PTA-CBC-1821-0264	10/23/09	Horizontal	2.5 - 3.0	1821 panel, center of north face, 2nd floor	1.67	0.170	
PTA-CBC-1821-0267	10/23/09	Horizontal	12.0 - 12.5	1821 panel, center of north face, 2nd floor	0.810	0.033	

Table 2-3
Exterior Bulk Concrete Characterization Data - Not in Direct Contact with Caulking
Peabody Terrace Remediation Plan

Sample ID	Sample Date	Joint Orientation	Distance From Joint (inches)	Sample Description	Total PCBs	Reporting Limit	Qualifier
Concrete Panels / Columns (continued)							
PTA-CBC-1911-0294	10/23/09	Horizontal	0.0 - 0.5	1911 Panel, east face, first floor under ceiling slab	25.5	1.62	
PTA-CBC-1911-0290	10/23/09	Horizontal	0.5 - 1.0	1911 Panel, east face, first floor under ceiling slab	7.85	0.330	
PTA-CBC-1911-0293	10/23/09	Horizontal	1.0 - 1.5	1911 Panel, east face, first floor under ceiling slab	5.41	0.330	
PTA-CBC-1911-0289	10/23/09	Horizontal	1.5 - 2.0	1911 Panel, east face, first floor under ceiling slab	2.03	0.160	
PTA-CBC-1911-0292	10/23/09	Horizontal	2.0 - 2.5	1911 Panel, east face, first floor under ceiling slab	4.40	0.330	
PTA-CBC-1911-0288	10/23/09	Horizontal	2.5 - 3.0	1911 Panel, east face, first floor under ceiling slab	0.551	0.033	
PTA-CBC-1911-0297	10/23/09	Horizontal	12.0 - 12.5	1911 Panel, east face, first floor under ceiling slab	0.359	0.033	
Concrete Adjacent to Metal Window Frames							
PTA-CBC-1821-0269	10/23/09	Vertical	0.0 - 0.5	1821 north window, 2nd floor, left side of frame	0.387	0.033	
PTA-CBC-1821-0270	10/23/09	Vertical	0.5 - 1.0	1821 north window, 2nd floor, left side of frame	0.551	0.033	
PTA-CBC-1821-0271	10/23/09	Vertical	1.0 - 1.5	1821 north window, 2nd floor, left side of frame	0.314	0.033	
PTA-CBC-1821-0273	10/23/09	Horizontal	0.0 - 0.5	1821 north window, 2nd floor, bottom sill of frame	0.479	0.033	
PTA-CBC-1821-0274	10/23/09	Horizontal	0.5 - 1.0	1821 north window, 2nd floor, bottom sill of frame	0.520	0.033	
PTA-CBC-1821-0275	10/23/09	Horizontal	1.0 - 1.5	1821 north window, 2nd floor, bottom sill of frame	0.406	0.033	
PTA-CBC-1821-0276	10/23/09	Horizontal	1.5 - 2.0	1821 north window, 2nd floor, bottom sill of frame	0.532	0.033	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. All samples collected from a depth of 0.5 inches into concrete surface.
5. J = Value is estimated based on data validation.

Table 2-4
Patio Bulk Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Patio Concrete					
PTA-CBC-2211-0224	Unit 22-11 Patio, 2.25' from east and 4.0' from south edge	10/22/09	0.056	0.033	
PTA-CBC-2211-0225	Unit 22-11 Patio, 4.5' from east and 2.0' from north edge; flush with overhang	10/22/09	ND	0.033	
PTA-CBC-2211-0226	Unit 22-11 Patio, within 0.5 inches of the pad/wall joint	10/22/09	0.867	0.033	
PTA-CBC-2211-0227	Unit 22-11 Patio, direct contact sample (depth of joint)	10/22/09	0.34	0.033	
PTA-CBC-1812-0231	Unit 18-12 Patio, 2.0' from east and 4.5' from south edge	10/22/09	0.07	0.033	J
PTA-CBC-1812-0232	Unit 18-12 Patio, 4.5' from east and 2.25' from north edge; flush with overhang	10/22/09	ND	0.033	
PTA-CBC-1812-0230	Unit 18-12 Patio, within 0.5 inches of the pad/wall joint	10/22/09	0.529	0.033	
PTA-CBC-1812-0229	Unit 18-12 Patio, direct contact sample (depth of joint)	10/22/09	0.479	0.033	
Patio Caulking					
PTA-CBK-1812-0332	Unit 18-12 Patio, caulking at the horizontal pad to vertical wall joint	12/08/09	27.8	1.52	J
PTA-CBK-2211-0341	Unit 22-11 Patio, caulking at the horizontal pad to vertical wall joint	12/08/09	64.9	5.21	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. J = Value is estimated based on data validation.

Table 2-5
Balcony Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Balcony Concrete					
PTA-CBC-1812-0233	1822 Balcony underside, 4.0' from north edge, 1.0' from west (outer) edge	10/22/09	1.07	0.033	
PTA-CBC-1812-0234	1822 Balcony underside, 3.0' from south edge, 1.5' from east (inner) edge	10/22/09	0.728	0.033	
PTA-CBC-1812-0235	1822 Balcony underside, 0.5 inches from joint	10/22/09	36.1	3.27	
PTA-CBC-2131-0333	2131 Balcony, random location (3' from building face)	12/08/09	2.53	0.17	
PTA-CBC-2131-0334	2131 Balcony, random location (1' from building face)	12/08/09	21.4	1.68	
PTA-CBC-2131-0335	2131 Balcony, 0-0.5 inches from joint (balcony slab surface)	12/08/09	124	6.7	
PTA-CBC-2131-0336	2131 Balcony, direct contact with joint (vertical wall surface)	12/08/09	4,430	167	
Balcony Caulking					
PTA-CBK-2131-0337	Unit 21-31 balcony caulking at the pad to building face joint; dark gray original caulking	12/08/09	139,000	6.37	J

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. J = Value is estimated based on data validation.

Table 2-6
Paved Adjacent Ground Surface Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Date	Sample Description	Total PCBs	Reporting Limit	Qualifier
Asphalt					
PTA-CBA-N-0279	10/23/09	North side asphalt, 14' north of building and 17' west of west face	ND	0.66	
PTA-CBA-N-0280	10/23/09	North side asphalt, 17.5' north of building and 9' east of west face	ND	0.63	
PTA-CBA-W-0285	10/23/09	West side asphalt, 95' south of north face, edge of walkway paralled with west face	ND	0.63	
PTA-CBA-W-0286	10/23/09	West side asphalt, 23' west of building, southern walkway perpendicular to west face	ND	0.66	
PTA-CBA-E-0301	10/23/09	East side asphalt, 8' east of building, in walkway to Building 18 lobby	0.802	0.33	
PTA-CBA-E-0302	10/23/09	East side asphalt, 12' east of building, in walkway ot Building 21 lobby	0.611	0.3	
Brick					
PTA-CBB-S-0252	10/22/09	South side brick walkway, 30" south of building, 10' from west face	0.033	0.033	
PTA-CBB-S-0253	10/22/09	South side brick walkway, 18" south of building, 17' from east face	0.187	0.033	J
Concrete					
PTA-CBC-E-0303	10/23/09	East side concrete pad under Building 18 lobby exterior overhang	ND	0.033	
PTA-CBC-E-0304	10/23/09	East side concrete pad under Building 21 lobby exterior overhang	0.057	0.033	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. J = Value is estimated based on data validation.

Table 2-7
Soil Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Depth (inches bgs)	Sample Date	Total PCBs	Reporting Limit
Building A Perimeter					
PTA-CBS-W-0071	Lawn west of Building A	0 - 3	09/10/09	1.91	0.079
PTA-CBS-W-0072	Lawn west of Building A	0 - 3	09/10/09	1.64	0.86
PTA-CBS-W-0236	West side soil beneath fabric and stone landscaping, 12" from building, south of unit 22-11 patio	7 - 10	10/22/09	0.637	0.033
PTA-CBS-W-0237	West side soil beneath fabric and stone landscaping, 12" from building, north of unit 19-12 patio	7 - 10	10/22/09	0.977	0.033
PTA-CBS-N-0255	North side soil beneath mulch, 12" from building, 9' from west face; 12" from nearest vertical joint	0.5 - 3.5	10/22/09	18.3	0.89
PTA-CBS-N-0257	North side soil beneath mulch, 18" from building, 14' from east face; 30" from nearest vertical joint	0.5 - 3.5	10/22/09	19.4	0.96
PTA-CBS-E-0258	East side soil beneath fabric and stone landscaping, 12" from building, 27' from north end	5 - 8	10/22/09	50.1	3.96
PTA-CBS-E-0259	East side soil beneath fabric and stone landscaping, 15" from building, 62' from south end	5 - 8	10/22/09	14.3	0.83
PTA-CBS-N-0281	North side soil, 6' north of building and 17' west of west face	0 - 3	10/23/09	0.592	0.04
PTA-CBS-N-0282	North side soil, 7' north of building and 9' east of west face	0 - 3	10/23/09	4.82	0.2
PTA-CBS-W-0283	West side soil, 19' west of building and 16' south of north face	0 - 3	10/23/09	1.61	0.073
PTA-CBS-W-0284	West side soil, 26' west of building and 52' south of north face; 2' from Building B	0 - 3	10/23/09	2.93	0.2
PTA-CBS-E-0299	East side soil, 10' east of building and 27' from north end of building	0 - 3	10/23/09	6.46	0.43
PTA-CBS-E-0300	East side soil, 10' east of building and 62' from south end of building	0 - 3	10/23/09	8.05	0.43
Building A Base of IRA Excavation					
PTA-CBS-N-0306	North face Building A - base of mulch bed after IRA excavation	12-15	11/18/09	0.964	0.04
PTA-CBS-N-0307	North face Building A - base of mulch bed after IRA excavation	12-15	11/18/09	10.9	0.89
PTA-CBS-N-0308	North face Building A - base of mulch bed after IRA excavation	12-15	11/18/09	5.92	0.2
PTA-CBS-N-0309	North face Building A - base of mulch bed after IRA excavation	12-15	11/18/09	8.97	0.4

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. Shaded rows indicate soils removed during IRA excavation activities.
4. ND = Not detected above laboratory's minimum reporting limit, as indicated.
5. IRA = Immediate Response Action (310 CMR 40.0410)
6. bgs = below ground surface.
7. Shaded rows indicate soils were removed during IRA excavation activities.

Table 2-8
Interior Caulking and Adjacent Surface Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Residential Unit Interior Bulk Caulking					
PTA-CBK-1812-0177	Unit 18-12 bedroom window joint (vertical section, right)	10/13/09	223	12.6	
PTA-CBK-2012-0187	Unit 20-12 living room window joint (vertical section, right)	10/13/09	61.5	3.99	
PTA-CBK-2211-0197	Unit 22-11 living room door joint (vertical section, right)	10/13/09	18.9	1.06	J
Residential Unit Interior Caulking Wipes (Results in ug/100cm^2)					
PTA-CWK-2211-0035	Living room window joint (horizontal section, bottom); hexane wipe	09/10/09	2.6	0.5	
PTA-CWK-2211-0036	Living room door joint (vertical); hexane wipe	09/10/09	2.8	0.5	
PTA-CWK-2211-0037	Bedroom window joint (horizontal section, top); hexane wipe	09/10/09	ND	0.5	
PTA-CWK-2021-0048	Living room door joint (vertical); hexane wipe	09/10/09	0.9	0.5	
PTA-CWK-2021-0049	Living room window joint (horizontal section, top); hexane wipe	09/10/09	2.6	0.5	
PTA-CWK-2021-0050	Bedroom window joint (vertical); hexane wipe	09/10/09	8.6	0.5	
PTA-CWK-1812-0058	Living Room window joint (vertical); hexane wipe	09/10/09	3.6	0.5	
PTA-CWK-1812-0061	Living room door joint (vertical); hexane wipe	09/10/09	1.0	0.5	
PTA-CWK-1812-0066	Bedroom window joint (vertical); hexane wipe	09/10/09	5.4	0.5	
PTA-CWK-2211-0083	Follow up after surficial cleaning, living room window joint (horizontal section, bottom); hexane wipe	09/22/09	1.1	0.5	
PTA-CWK-2211-0084	Follow up after surficial cleaning, living room door joint (vertical); hexane wipe	09/22/09	0.5	0.5	
PTA-CWK-2211-0085	Follow up after surficial cleaning, bedroom window joint (horizontal section, top); hexane wipe	09/22/09	1.3	0.5	
PTA-CWK-1812-0086	Follow up after surficial cleaning, living room window joint (vertical); hexane wipe	09/22/09	1.6	0.5	
PTA-CWK-1812-0087	Follow up after surficial cleaning, living room door joint (vertical); hexane wipe	09/22/09	ND	0.5	
PTA-CWK-1812-0088	Follow up after surficial cleaning, bedroom window joint (vertical); hexane wipe	09/22/09	5.6	0.5	
PTA-CWK-1812-0168	Bedroom window joint (vertical section, right); isopropyl alcohol wipe	10/01/09	29	3	
PTA-CWK-1812-0169	Bedroom window joint (vertical section, right); saline wipe	10/01/09	ND	0.5	
PTA-CWK-1812-0170	Bedroom window joint (vertical section, right); hexane wipe	10/01/09	21	3	
PTA-CWK-2012-0185	Living room window joint (vertical section, right) saline wipe	10/13/09	ND	0.5	
PTA-CWK-2012-0186	Living room window joint (vertical section, right); hexane wipe	10/13/09	2.2	0.5	
PTA-CWK-2211-0195	Living room door joint (vertical section, right); saline wipe	10/13/09	ND	0.5	
PTA-CWK-2211-0196	Living room door joint (vertical section, right); hexane wipe	10/13/09	0.8	0.5	J

Table 2-8
Interior Caulking and Adjacent Surface Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Residential Unit Interior Adjacent Surface Wipes (Results in ug/100cm^2)					
PTA-CWC-2211-0043	Living room north wall; hexane wipe	09/10/09	2.5	0.5	J
PTA-CWC-2021-0055	Living room south wall; hexane wipe	09/10/09	2.1	0.5	
PTA-CWC-1812-0059	Living room south wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWD-2211-0041	Bedroom desk; hexane wipe	09/10/09	ND	0.5	
PTA-CWD-2021-0052	Painted wood step leading to balcony; hexane wipe	09/10/09	ND	0.5	
PTA-CWD-1812-0067	Bedroom desk; hexane wipe	09/10/09	ND	0.5	
PTA-CWM-2211-0038	Living room radiator under window; saline wipe	09/10/09	ND	0.5	
PTA-CWM-2211-0039	Bedroom window frame (horizontal section, top); saline wipe	09/10/09	ND	0.5	UJ
PTA-CWM-2211-0044	Bedroom radiator under desk; saline wipe	09/10/90	ND	0.5	
PTA-CWM-2021-0053	Bedroom window frame (vertical section); saline wipe	09/10/09	ND	0.5	
PTA-CWM-2021-0057	Living room door frame (vertical section); saline wipe	09/10/09	ND	0.5	
PTA-CWM-1812-0060	Living room window frame (horizontal section, bottom); saline wipe	09/10/09	ND	0.5	
PTA-CWM-1812-0062	Living room door frame (vertical section); saline wipe	09/10/09	ND	0.5	
PTA-CWT-2211-0032	Bedroom floor; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2211-0033	Living room floor near door; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2211-0034	Living room floor near kitchen; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2021-0045	Living room floor near door; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2021-0046	Hallway floor near kitchen; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2021-0047	Bedroom floor; saline wipe	09/10/09	ND	0.5	
PTA-CWT-1812-0064	Living room floor near window; saline wipe	09/10/09	ND	0.5	
PTA-CWT-1812-0065	Kitchen floor; saline wipe	09/10/09	ND	0.5	
PTA-CWT-1812-0068	Bedroom floor; saline wipe	09/10/09	ND	0.5	
PTA-CWW-2211-0042	Living room south wall; hexane wipe	09/10/09	0.5	0.5	
PTA-CWW-2021-0054	Living room north wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWW-2021-0056	Bedroom south wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWW-1812-0063	Living room north wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWW-1812-0069	Bedroom west wall; hexane wipe	09/10/09	ND	0.5	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in milligrams per kilogram (mg/kg).
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. J or UJ = Value is estimated based on data validation.

Table 2-9
Indoor Air Characterization Data
Peabody Terrace Remediation Plan

Bulk Caulking Sample Result (mg/kg)	Air Sample ID	Sample Description	Sample Date	Total Homologs (ng/cartridge)	Flow Rate (L/Minute)	Duration (minutes)	Total Volume (m3)	PCB Conc (ng/m3)	Qualifier
Residential Unit Indoor Air									
223	PTA-CAR-1812-0370	Building A Unit 18-12 Living Room	02/02/10	31.7	2.50	120	0.300	105.7	
	PTA-CAR-1812-0371	Building A Unit 18-12 Bedroom	02/02/10	34.0	2.53	120	0.303	112.2	
61.5	PTA-CAR-2012-0373	Building A Unit 20-12 Living Room	02/02/10	25.6	2.50	120	0.300	85.3	
	PTA-CAR-2012-0374	Building A Unit 20-12 Bedroom	02/02/10	22.8	2.51	120	0.301	75.7	J
Outdoor Air (Background)									
N/A	PTA-CAR-W-0372	Courtyard 74' West of Bldg A 69' South of Bldg B	02/02/10	22.3	2.48	120	0.297	75.1	

Notes:
1. Air samples collected in accordance with USEPA Compendium Method TO-10A and submitted for laboratory analysis of PCB homologs.
2. The flow rate displayed is the average flow rate as measured at the beginning and end of the sampling period.
3. Total PCB concentration is the total PCB homologs reported by the lab (ng/cartridge) per corrected sample volume (m^3/cartridge).
4. J = Value is estimated based on data validation.

Table 3-1
Building A Containment Barrier Pilot Test Details & Results
Peabody Terrace Remediation Plan

Pilot Test Number	Surface Preparation		Coating		Encapsulated Surface Samples (interval in inches)	Encapsulated Surface Sample ID (hexane preserved)	Total PCBs (ug/100cm^2)	Epoxy Adhesion Test	New Caulking Sample Collection	Caulking Sample ID	Wipe Sample Preservative	Total PCBs (ug/100cm^2)	Caulking Adhesion (Pull Test)
	Caulked Surface	Exposed Face (not caulked)	Caulked Surface	Exposed Face (not caulked)									
Horizontal joint and area below joint													
Test # 1A	Knife; hand tools; no grinding	Power wash	Sika 62 Interior of joint 2 coats	Sika 670 W clear; 0 - 3-inches (min); 2 coats	Sika 62;	PTA-CWE-1811-0310	< 0.5	NT	Sika 2C new caulking wipe (saline and hexane)	PTA-CWK-1811-0342	Saline	< 0.5	Met adhesion criteria
					Sika 670 W (0-0.5);	PTA-CWC-1811-0311	< 0.5			PTA-CWK-1811-0343	Hexane	0.6	
					Sika 670 W (> 0.5 - 3 inch)	PTA-CWC-1811-0312	< 0.5			PTA-CWK-1811-0356	None	< 0.5	
Test # 2A	Grinding; w/ dust control	Power wash	Sika 62 Interior of joint 2 coats	Sika 62 extended 0.5-inch onto exposed face; Enviroseal 20 Clear 0.5 - 3 - inches (min); 2 coats	Sika 62;	PTA-CWE-1811-0313	1.1	Met adhesion criteria	Sika 2C new caulking wipe (saline and hexane)	PTA-CWK-1811-0344	Saline	< 0.5	Met adhesion criteria
					Sika 62 (0-0.5);	PTA-CWE-1811-0314	3.9			PTA-CWK-1811-0345	Hexane	< 0.5	
					Enviroseal 20 (> 0.5 - 3 inch)	PTA-CWC-1811-0315	35			PTA-CWK-1811-0357	None	< 0.5	
Vertical joint and both exposed faces on either side of the joint													
Test # 1B	Knife; hand tools; no grinding	Power wash	Sika 62 Interior of joint 2 coats	Sika 670 W clear on one side; Enviroseal 20 Clear on other side; 0 - 3-inches (min); 2 coats;	Sika 62;	PTA-CWE-1811-0316	< 0.5	Met adhesion criteria	Sika 2C new caulking wipe (saline and hexane)	PTA-CWK-1811-0346	Saline	< 0.5	Met adhesion criteria
					Sika 670 W (0-0.5);	PTA-CWC-1811-0317	< 0.5			PTA-CWK-1811-0347	Hexane	< 0.5	
					Enviroseal 20 (0-0.5)	PTA-CWC-1811-0318	0.9			PTA-CWK-1811-0358	None	< 0.5	
					Sika 670 W (> 0.5 - 3 inch)	PTA-CWC-1811-0319	< 0.5			--	--	--	
					Enviroseal 20 (> 0.5 - 3 inch)	PTA-CWC-1811-0320	< 0.5			--	--	--	
Test # 2B	Grinding; w/ dust control	Power wash	Sika 62 Interior of joint 2 coats	Sika 62 extended 0.5-inch onto exposed face; Enviroseal 20 Clear 0.5 - 3 - inches (min); both sides; 2 coats	Sika 62;	PTA-CWE-1811-0321	< 0.5	NT	Sika 2C new caulking wipe (saline and hexane)	PTA-CWE-1811-0348	Saline	< 0.5	Met adhesion criteria
					Sika 62 (0-0.5);	PTA-CWE-1811-0322	< 0.5			PTA-CWE-1811-0349	Hexane	< 0.5	
					EnviroSeal 20 (> 0.5 - 3 inch)	PTA-CWC-1811-0323	< 0.5			PTA-CWK-1811-0359	None	< 0.5	
Test # 2C	Grinding; w/ dust control	Power wash	Sika 62 Interior of joint 2 coats	Sika 62 extended 0.5-inch onto exposed face; Sika 670 W gray 0.5 - 3 - inches (min); both sides; 2 coats.	Sika 62;	PTA-CWE-1811-0324	< 0.5	NT	Sika 2C new caulking wipe (saline and hexane)	PTA-CWK-1811-0350	Saline	< 0.5	Met adhesion criteria
					Sika 62 (0-0.5);	PTA-CWE-1811-0325	< 0.5			PTA-CWK-1811-0351	Hexane	< 0.5	
					Sika 670 gray (> 0.5 - 3)	PTA-CWC-1811-0326	< 0.5			PTA-CWK-1811-0360	None	< 0.5	
Test # 3	Knife; hand tools; no grinding	Power wash	Sika 62 Interior of joint 2 coats	Sika 62 extended 0.5-inch onto exposed face; both sides; 2 coats	Sika 62;	PTA-CWE-1811-0327	< 0.5	NT	Silispan strip wipe (saline and hexane)	PTA-CWK-1811-0352	Saline	< 0.5	NT
					Sika 62 (0-0.5);	PTA-CWE-1811-0328	< 0.5			PTA-CWK-1811-0353	Hexane	< 0.5	
					--	--	--			PTA-CWK-1811-0361	None	< 0.5	
Concrete Panel													
Test # 4	Knife; hand tools; no grinding	Power wash	Sika 62 Interior of joint 2 coats	Sika 62 extended 0.5-inch onto exposed face of vertical joint only; Sika 550 W paint over portion of panel; 2 coats.	Sika 62;	PTA-CWE-1811-0329	0.5	NT	No new caulking installed at this pilot test location	--	--	--	Met adhesion criteria
					Sika 550W (0 - 0.5 inch)	PTA-CWC-1811-0330	< 0.5			--	--	--	
					Sika 550W (> 0.5 - 3 inch)	PTA-CWC-1811-0331	0.6			--	--	--	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in micrograms per 100 cm^2 (ug/100 cm^2) and were collected from 100 cm^2 areas using wipes provided by the laboratory, preserved as indicated.
3. ND = Not detected above laboratory's minimum reporting limit, as indicated.
4. NT = Not tested.

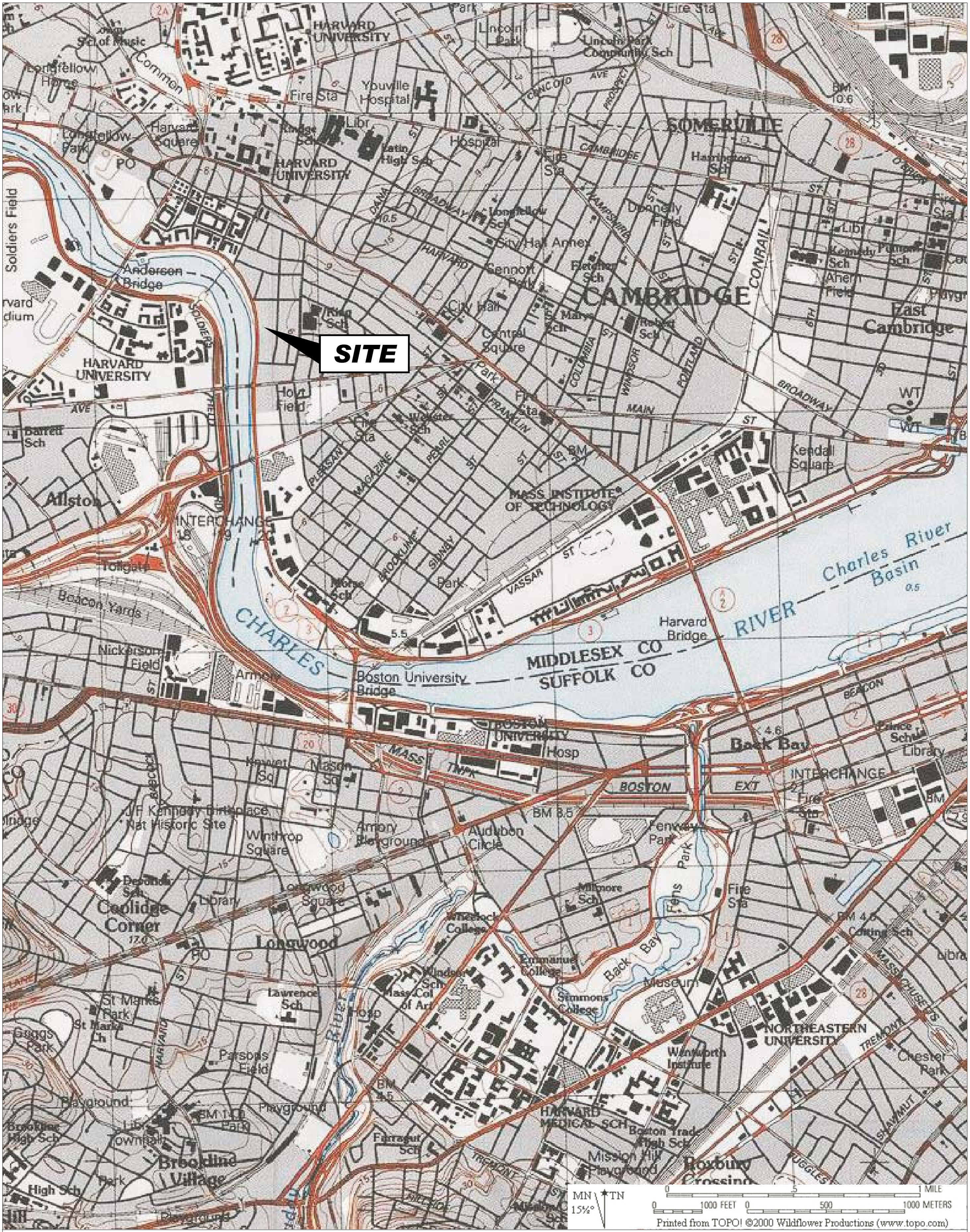
Table 3-2
Summary of Building A Pilot Test Implementability, Effectiveness, and Aesthetics
Peabody Terrace Remediation Plan

	Sikagard 62 Epoxy (Gray)	EnviroSeal 20 (Clear)	Sikagard 670W Clear	Sikagard 670W Gray	Sikagard 550W Elastocolor (Gray)	Sikaflex 2C (Bronze)	Sil-Span (Bronze)
Implementability	Highly viscous, short pot-life; able to be sprayed or painted on; effectively coats surfaces to desired extent. *Rating: Fair*	Very liquid upon application (runs like water), drips beneath masked edges on masonry; full-scale use would only be practical if applied to entire panels. *Rating: Poor*	Relatively easy to apply, does not run on vertical surfaces with thin and even coats; effectively coats surfaces to desired extent. *Rating: Good*	Very easy to apply (consistency of a typical exterior latex paint), does not run on vertical surfaces with thin and even coats; effectively coats surfaces to desired extent. *Rating: Good*	Very easy to apply (consistency of a typical exterior latex paint), does not run on vertical surfaces with thin and even coats; effectively coats surfaces to desired extent. *Rating: Good*	Two-part caulking; installation is typical of exterior caulking. *Rating: Good*	A preformed silicone profile strip is affixed to the surface of the concrete panel with an adhesive applied on either side of the caulked joint. *Rating: Good*
Effectiveness	Effectively contained concrete with residual PCBs > 200 ppm at 5 of 7 locations inside joint, and concrete with concentrations > 100 ppm at 3 of 4 locations within 0.5" of the joint; maximum reported wipe result of 1.1 ug/100cm^2 inside joint and 3.9 ug/100cm^2 within 0.5" of the joint. *Rating: Good*	Somewhat effective in containing residual PCBs > 100 ppm within 0.5" of the joint - one wipe sample reported at 0.9 ug/100cm^2. Somewhat effective in containing residual PCBs < 25 ppm at 0.5-3" from the joint - two wipe samples reported at non-detect and one reported at 35 ug/100cm2. *Rating: Fair*	Effective in containing residual PCBs > 100 ppm within 0.5" of the joint *and* residual PCBs < 25 ppm at 0.5-3" from the joint - two wipe samples from each interval reported at non-detect (4 samples total). *Rating: Good*	Effective in containing residual PCBs < 25 ppm at 0.5-3" from the joint - one wipe sample reported at non-detect. *Rating: Good*	Effective in containing residual PCBs > 100 ppm within 0.5" of the joint - one wipe sample reported at non-detect. Somewhat effective in containing residual PCBs < 25 ppm at 0.5-3" from the joint - one wipe sample reported at 0.6 ug/100cm^2. *Rating: Good*	PCBs reported ND at 5 out of 6 sample locations (6th location reported at 0.6 ug/100cm^2) - 17 out of 18 wipe samples reported at non-detect using a hexane-preserved, a saline-preserved, and a dry wipe at each location. *Rating: Good*	Effective in containing residual PCBs within the joint and the adjacent concrete face covered by the Sil-Span - three wipe samples reported at non-detect using a hexane-preserved, a saline-preserved, and a dry wipe. *Rating: Good*
Aesthetics	Cured product creates a non-porous surface coating that is initally very glossy, but appears streaky and discolored after long-term exposure to sunlight (non UV-resistant); however epoxy in joint would be beneath caulking. *Rating: Fair*	Cured product appears invisible - matches the appearance of adjacent uncoated concrete. *Rating: Good*	Cured product has a glossy / shiny appearance, slightly distinguishable from adjacent uncoated concrete at edge of coated area. *Rating: Good*	Cured product dries evenly and in a color true to the chart used for color selection; surface has a matte appearance and natural feel and finish similar to the underlying concrete. *Rating: Fair*	Cured product dries evenly and in a color a shade lighter than the chart used for color selection; surface has a matte appearance and natural feel and finish similar to the underlying concrete. *Rating: Fair*	Typical of exterior caulking; can be color matched to the current caulking color or to the adjacent building surfaces. *Rating: Good*	The strip covers a width of approximately 2 inches over the 3/4-inch wide caulking joint; multiple colors available. *Rating: Fair*
Summary & Recommendations	*Although the implementation and aesthetics received fair ratings, this product is most effective at encapsulating high level residual PCBs and is recommended f(or a similar epoxy-type product, e.g., Sikadur 35) or use in the joints after caulking removal.*	*Given the poor implementability and fair effectiveness, this product is not recommended for use in full-scale implementation.*	*Given it's good ratings in each category, this product is recommended for use on concrete surfaces adjacent to caulked joints; full-scale application would result in minimal changes to the appearance of the façade.*	*Although this product is easily implementable and effective, the colored finish may not be a desirable option from an aesthetic standpoint.*	*Although this product is easily implementable and effective, the colored finish may not be a desirable option from an aesthetic standpoint.*	*Easily implementable, effective, and color options are available to achieve desired outcome.Implementation would result in minimal changes to the appearance of the façade.*	*Although this product is fairly easy to implement and is effective, the two-inch wide colored strip over the joint may not be a desirable option from an aesthetic standpoint.*

Implementability Notes : Good ratings were given to any product that was easy to apply in comparison to typical exterior paints or caulking materials. Fair ratings were given to any product where application or use of the product was more complicated in comparison to easier products. Poor ratings were given to any product that is not recommended for full-scale implementation.

Effectiveness Notes : Good ratings were given for products where surface wipe samples collected after application were reported as non-detect or close to non-detect for PCBs. Fair ratings were given for products where surface wipe samples collected after application were reported at higher levels for PCBs, but achieved at least some level of contaminant reduction. No products were given poor ratings.

Aesthetic Notes : Good ratings were given to any product that does not markedly change the appearance of the façade. Fair ratings were given to any product where the final appearance of the façade would be visibly distinct from the present appearance. No products were given poor ratings.



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COMMITMENT & INTEGRITY DRIVE RESULTS

PEABODY TERRACE
CAMBRIDGE, MASSACHUSETTS
REMEDIATION PLAN

SCALE: AS NOTED	JOB NO.: 210980
DATE: JANUARY 2010	FILE: Figure 1-1.cnv

SITE LOCUS

DES.BY: EVR
DR.BY: EVR
CK.BY: JAH

1-1

LEGEND

A BUILDING IDENTIFIER
1 PLAY AREA IDENTIFIER
1 BUILDING ENTRY
FENCE
ASPHALT
DIRT
GRASS
PLAY SAND
MULCH
ARTIFICIAL SURFACE (RUBBER OR TURF)
BRICKS
CONCRETE
STONE

-DRAFT-

NOTE: WOODARD & CURRAN HAS ADAPTED THIS SITE PLAN TO REFLECT THE APPROXIMATE LOCATIONS OF VARIOUS GROUND SURFACES BETWEEN BUILDINGS. THE BUILDING PLAN WAS ORIGINALLY DEVELOPED BY SIMPSON GUMPERTZ & HEGER ON BEHALF OF HARVARD REAL ESTATE SERVICES, AND IS NOT TO BE REDISTRIBUTED WITHOUT EXPRESS PERMISSION FROM HARVARD REAL ESTATE SERVICES.

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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

SITE PLAN

DESIGNED BY: ALW CHECKED BY: JAH
DRAWN BY: EVR Figure 1–2 New Bldgs.dwg

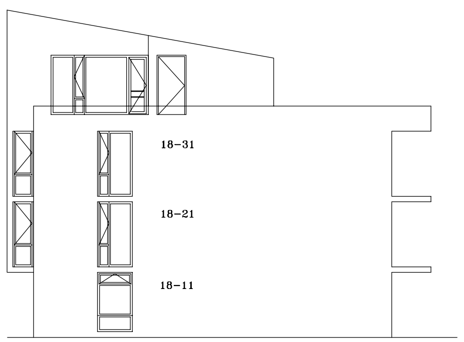
PEABODY TERRACE
CAMBRIDGE, MASSACHUSETTS

REMEDIATION PLAN

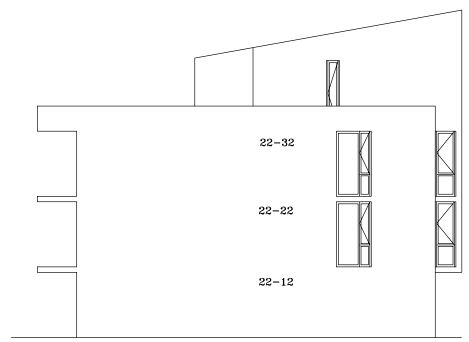
JOB NO: 210980
DATE: JANUARY 2010
SCALE: AS NOTED

FIGURE 1-2

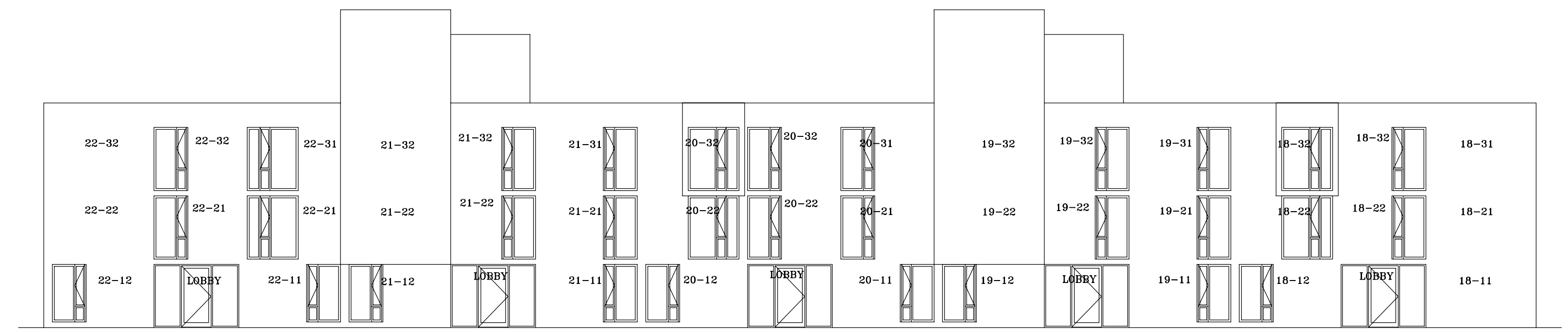
BUILDING A - NORTH ELEVATION



BUILDING A - SOUTH ELEVATION



BUILDING A - EAST ELEVATION



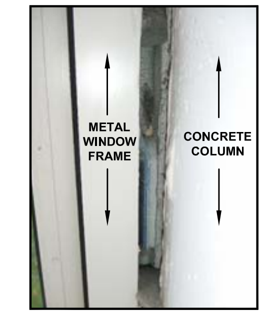
NORTH FACADE

SOUTH FACADE

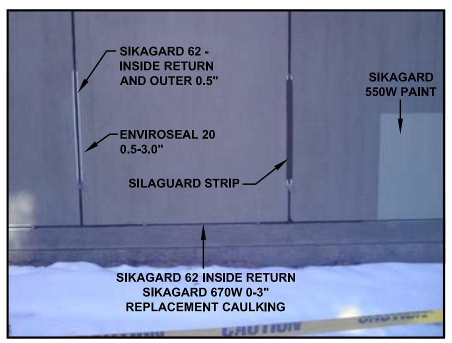
EAST FACADE

PANEL AND COLUMN CAULKING

INTERIOR WINDOW CAULKING



INTERIOR WINDOW JOINT

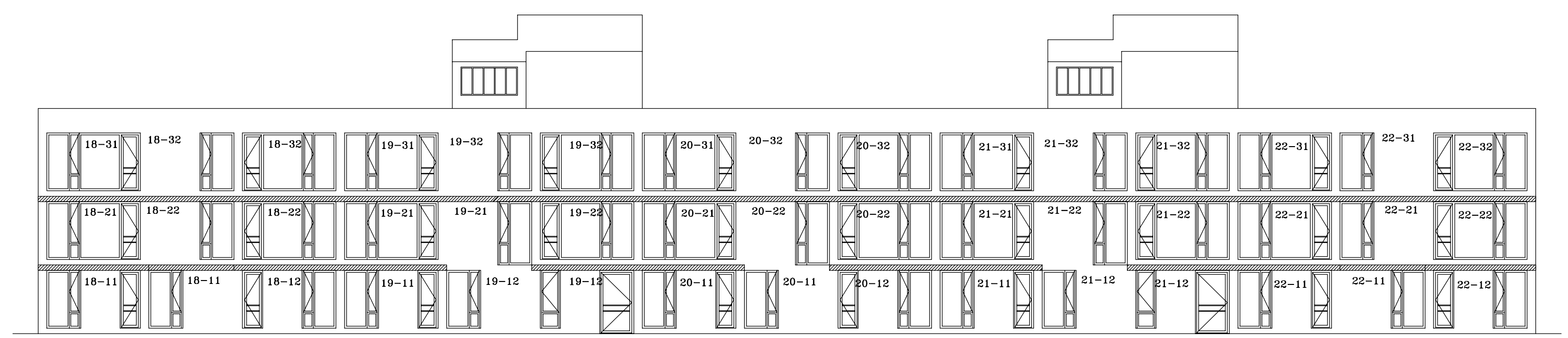


PILOT TESTS

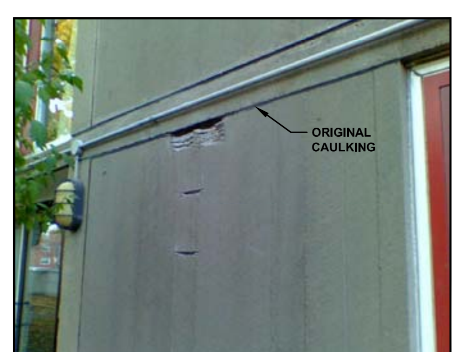
PILOT TEST 1A

SOIL REMOVAL

BUILDING A - WEST ELEVATION



WEST FACADE



CONCRETE SAMPLES

UNIT 20-21 BALCONY SURFACE

PATIO DOOR CAULKING (REPLACEMENT)

UNIT 22-11 PATIO

NOTE: DRAWING ADAPTED FROM SG&H DRAWING A1.1: "BUILDING A, BUILDING B/C ELEVATIONS".

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REV	DESCRIPTION	DATE

DESIGNED BY: | DRAWN BY: EVR | CHECKED BY: | Figure 2-1.dwg

BUILDING A ELEVATIONS

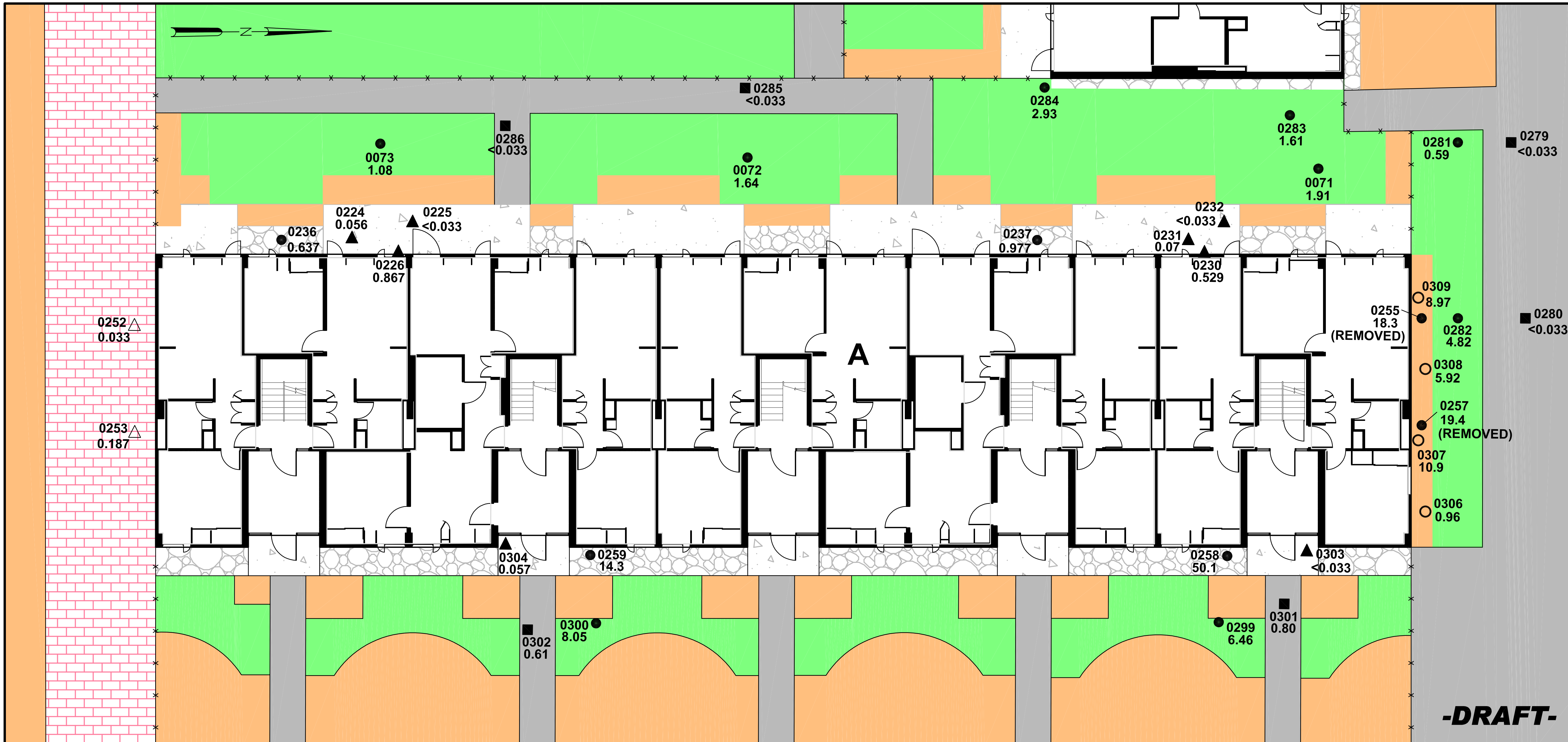
PEABODY TERRACE
CAMBRIDGE, MASSACHUSETTS

REMEDIATION PLAN

JOB NO.: 210980
DATE: JANUARY 2010
SCALE: N.T.S.
SHEET: OF

FIGURE 2-1

\\Andover\projects\210980 Harvard University - Peabody Terrace\wip\Drawings\Remediation Plan - Jan2010\Figure 2-1.dwg, Jan 22, 2010 - 1:20pm



LEGEND

A BUILDING IDENTIFIER

FENCE

ASPHALT

GRASS

MULCH

BRICKS

CONCRETE

STONE

0303 ▲ BULK CONCRETE SAMPLE LOCATION AND IDENTIFIER (0-0.5" bgs)

0301 ■ BULK ASPHALT SAMPLE LOCATION AND IDENTIFIER (0-0.5" bgs)

0236 ● BULK SOIL SAMPLE LOCATION AND IDENTIFIER (0-3" bgs)

0252 △ BULK BRICK SAMPLE LOCATION AND IDENTIFIER (0-0.5" bgs)

0306 ○ BULK SOIL SAMPLE LOCATION AND IDENTIFIER (12-15" bgs)

0.977 PCB CONCENTRATION IN mg/kg

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BUILDING A GROUND SURFACE SAMPLE LOCATIONS

DESIGNED BY: ALW
DRAWN BY: EVR
CHECKED BY: JAH
Figure 2-2.dwg

PEABODY TERRACE
CAMBRIDGE, MASSACHUSETTS

REMEDIATION PLAN

JOB NO: 210980
DATE: JANUARY 2010
SCALE: AS NOTED

FIGURE 2-2

APPENDIX A: SUPPORTING INFORMATION - RISK EVALUATION

Upon learning that Building A exterior caulking samples contained percent level concentrations of PCBs (up to 139,000 ppm total PCBs), Harvard began to collect a comprehensive set of characterization data to ensure that tenants and users of Peabody Terrace were not subject to unsafe conditions based on the presence of PCBs in the exterior caulking.

Characterization sample collection was prioritized at the following locations:

1. Exterior locations with higher exposure potential and likely PCB transport pathways (i.e., designated play areas adjacent to buildings and lawns adjacent to ground-floor patios across the complex);

2. On-site daycares and interior common rooms throughout the complex where it was likely that children may be present; and

3. Apartment unit interior surfaces and attached exterior patios and balconies (Building A only, at this time).

As an initial step in the data evaluation process, action levels were developed using a combination of published regulatory information or derived using standard health risk-based approaches. Two types of action levels were developed: a “lower” action level, which are levels at or below which no further action will be taken, and “immediate” action levels, which are levels above which an accelerated response action will be taken, such as placement of barriers to eliminate exposure, removal of material, etc. Levels found between the lower and immediate action levels would warrant either additional evaluation or monitoring, or in some instances, an interim measure may be implemented, such as covering a material with a temporary protective cover or prohibiting access to areas. These action levels are summarized and presented with supporting risk calculations at the end of this Appendix (*Technical Memorandum – Surface Wipe, Soil, and Indoor Air Action Levels*).

Based on the data review and action level comparisons, interim measures at some exterior locations were implemented (installing geofabric and mulch in a play area, covering up exposed exterior caulking in an outdoor daycare play area, etc.) which resulted in stabilized site conditions in these higher potential exposure areas.

The results of the data collection and evaluation of these areas is summarized in the following two technical memorandums that include a summary of the data, stabilization measures, and comparisons to action levels. The memos are presented in the following order:

1. A technical memorandum presenting the residential unit characterization data in Building A, and a data summary (Table A-1);

2. A technical memorandum presenting the daycare and common area characterization data from Buildings D, E, and F; and a data summary (Table A-2).

The data presented herein indicate that although detectable levels of PCBs are present in samples collected from some exterior and interior caulking and, less frequently in adjacent materials (window frames, floors, concrete, soils, etc.), they are not likely to result in significant exposures or health risks in the time frames estimated to complete remediation of the caulking and associated impacted materials. This conclusion is based on the following:

- All caulking was observed to be intact (i.e., not brittle or deteriorating).

- Interior surfaces (such as floors, lower walls, sills) within residential units are considered to be those with the highest potential for exposure, relative to caulking materials (interior or exterior) and exterior surfaces such as patios or balconies. The data indicate that PCBs were infrequently detected on these surfaces and that none of the detected levels exceeded the derived action levels.

- Saline wipe data, which are likely more representative of the available PCB fraction for dermal contact over the short term relative to the stronger extractant of hexane, were non-detect for interior caulking wipes.

- Indoor air samples collected from two Building A units (4 samples total) were all reported below the most stringent action level for total PCBs (140 ng/m^3), with concentrations ranging from 68.0 to 100.8 ng/m^3. In addition, these results were comparable to the ambient outdoor air (background) sample, which was reported with a total PCB concentration of 67.5 ng/m^3.

Based on the above, and as detailed in the subsequent memoranda, additional immediate actions or interim measures are not warranted as it is not anticipated that the proposed remediation schedule would cause significant potential health risks in comparison to a more accelerated schedule.

Technical Memorandum: Residential Unit Characterization Data for Building A

This summary memorandum has been prepared to consolidate the results from samples collected to assess potential PCB exposures from caulking and adjacent materials in potential exposure areas for residents within their apartment units at Peabody Terrace. At this time, samples have been collected from Building A only and included:

- Bulk samples of interior and exterior caulking;
- Bulk samples of exterior concrete patios and balcony decks;
- Surface wipe samples from interior and exterior accessible surfaces (interior and exterior caulking, walls, floors, window frames, and concrete patio/balcony decks);
- Indoor air samples from inside two of the units.

Bulk, surface wipe, and indoor air samples were collected from Building A residential units to assess potential PCB exposures in the most likely potential exposure areas.[1] The primary exposure pathways for potential PCB exposures for tenants of the units are direct contact with subsequent dermal absorption and incidental ingestion (hand to mouth contact) and, inhalation of particulate matter/dust.

The following sections summarize the sampling data collected from residential units of Building A and compare concentrations to the action levels (as presented in the attached Technical Memorandum: Surface Wipe, Soil, and Indoor Air Action Levels). In addition, bulk sample results from interior and exterior caulking and concrete associated with the tenant spaces is presented alongside the wipe sample data to present a complete picture of the characterization data collected from residential units to date. A summary table of the data is presented on the attached Table A-1.

During the initial phases of the characterization in the Fall of 2009, surface wipe samples were collected from unit interiors. The sampling sequence began with surface wipes of interior caulking and adjacent surfaces within four vacant units, and was followed by bulk caulking and additional caulking surface wipe samples. Surface wipes and bulk caulking and concrete samples were then collected from exterior spaces associated with the residential units, including three ground floor patio areas and one third floor balcony. Indoor air samples were collected from two of the units in February 2010.

Data are also presented for two different wipe solvents: one using hexane (standard EPA wipe test method for spills of PCBs) and the other using saline solution. Saline is considered more representative of how the human skin would dislodge PCBs from a surface than a hexane solution and these samples were collected as part of a weight of evidence evaluation and not as part of a final verification/closure sampling objective.

Refer to relevant sections of the PCB Remediation Plan for descriptions of sample collection and laboratory analytical methods.

Interior Caulking and Accessible Surfaces: Wipe Data

Surface wipe samples were collected from each of three vacant apartments (Units 18-12, 20-21, and 22-11) to assess interior caulking and accessible interior surfaces such as surfaces adjacent to caulking, lower walls, and floors. A total of 39 interior samples were collected: twelve samples from interior caulking and 27 samples from adjacent surfaces.

Summary statistics for interior wipe samples using hexane are presented in the table below. If the same surfaces were sampled more than once, only the most recent results are included on the table.

[1] Although soil exposures are also an exposure pathway to tenants, the assessment of soil exposures is addressed separately from this memorandum, which focuses on potential exposures at the tenant's apartment unit.

Sample Type	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Interior Caulking (Hexane)	12	11/12 (92%)	0.5-21	3.9
Interior Accessible Surfaces (Hexane)	27	3/27 (11%)	0.5-2.5	0.41

Note: All results are presented in micrograms per 100 cm^2 ($\mu g/100\ cm^2$).

As shown in the above table, only 3 of the 27 accessible surface samples reported detectable concentrations of PCBs (0.5, 2.1, and 2.5 $\mu g/100cm^2$). All three samples were collected from the lower walls in the living room areas adjacent to the window/door to the balcony/patio. In comparison to the project-specific action levels, all three samples were below the lower project-specific action level for interior surfaces of 3.3 $\mu g/100cm^2$.

Eleven of the twelve caulking wipe samples detected PCBs above the laboratory's reporting limit. Consistent with the project's pre-developed response actions, additional testing was conducted following surface cleaning of those surfaces that exceeded the action levels. The purpose of this step was to assess whether the results were related to dust/particulate on the surface of the material. Following cleaning, four of six samples showed a slight decrease in concentration while two showed a slight increase or relatively similar concentration. These results indicated only a slight change in concentration due to cleaning.

Additional surface wipe testing was performed using saline-preserved surface wipes. Saline was selected because of its chemical similarity to fluids found on human skin and was thought to be more representative of the level of PCBs available for transfer in a direct contact scenario. Six surface wipe samples (three hexane wipes and three saline wipes) were collected from the interior caulking at window and door frames. The hexane wipe samples of the interior caulking material were reported at concentrations ranging from 0.8 to 21 $\mu g/100cm^2$ and the adjacent saline wipes were all reported as non-detect (below laboratory reporting limits of 0.5 $\mu g/100cm^2$). Below is a table providing summary statistics for the October 2009 interior caulking wipe samples, of which the hexane samples are a subset of the overall hexane wipe sample data set (see table above).

Sample Type (Interior Caulking)	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Hexane	3	3/3	0.8-21	8.0
Saline	3	0/3	ND	ND

Notes:
1. All results are presented in micrograms per 100 cm^2 ($\mu g/100\ cm^2$).
2. ND = Not detected, below 0.5 ug/wipe

Interior Caulking: Bulk Data

The bulk caulking samples collected from three unit interiors indicate that the interior window / door white caulking contains PCBs at concentrations of 18.9, 61.5, and 223 mg/kg. Although the caulking was installed in the 1990s and is not considered a bulk product waste (i.e., it was not manufactured with PCBs), the material is considered a PCB remediation waste and is subject to upcoming remedial actions as described in the Remediation Plan for Building A.

Exterior Caulking and Accessible Surfaces: Wipe Data

Eighteen exterior surface wipe samples were collected from accessible areas of the ground floor patios outside of Units 18-12, 20-12, and 22-11. At each location, surface wipe samples were collected from two exterior caulking joints (a concrete to concrete joint and a concrete to metal joint) and from two surfaces adjacent to exterior caulking (a concrete wall and a concrete pad surface).

Of the six hexane-preserved samples collected from the concrete walls and pad surfaces of each patio and metal door/window frames, all six were reported as non-detect for PCBs as they were not present above laboratory reporting limits of 0.5 $\mu g/100cm^2$. Of the six hexane-preserved wipes collected from the exterior caulking, five were reported above the detection limit at concentrations ranging from 0.9 to 8.3 μg/100 cm^2. Summary statistics for the exterior wipe samples using hexane are presented in the table below.

Sample Type	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Exterior Caulking (Hexane)	6	5/6 (83%)	0.9-8.3	3.1
Exterior Accessible Surfaces (Hexane)	6	0/6 (0%)	ND	ND

Notes:
1. All results are presented in micrograms per 100 cm^2 (μg/100 cm^2).
2. ND = Not detected, below 0.5 ug/100 cm^2

Of the five caulking wipe samples, only one slightly exceeded the lower action level of 8 μg/100 cm^2 for exterior surfaces and none exceeded the immediate action level.

Similar to the interior surfaces, wipe samples were collected at the same exterior caulking locations using saline to better simulate potential direct contact exposures by tenants. Of the six saline wipes collected from the exterior caulking, five were reported above the detection limit at concentrations ranging from 0.7 to 3.7 μg/100 cm^2. Of the six hexane wipe samples, five samples had detectable concentrations ranging from 0.9 to 8.3 μg/100 cm^2. Although the frequency of detection is the same between the two solutions, the mean saline concentration is approximately three times less than the mean of the hexane wipe data, and well below the action level of 3.3 μg/100 cm^2 . All these data are summarized in the table below.

Sample Type (Exterior Caulking)	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Hexane	6	5/6	0.9-8.3	3.1
Saline	6	5/6	0.7-3.7	1.3

Notes:
1. All results are presented in micrograms per 100 cm^2 (μg/100 cm^2).
2. Arithmetic mean was calculated using one-half the laboratory reporting limit where ND.

The upper-floor balconies are constructed differently than ground-floor patios – whereas the horizontal balcony surfaces date to original building construction, the horizontal patio pad surfaces appeared to have been installed within the last 15 years. As such, the same exterior characterization sampling activities were conducted at an available upper-floor balcony, Unit 21-31.

Exterior surface wipe samples were collected from the caulking at the horizontal pad to vertical wall joint (2 samples; 1 hexane and 1 saline) and from two locations on the horizontal concrete pad (hexane solution). The concrete pad samples were reported as < 0.5 μg/100cm^2 and 5.9 μg/100cm^2. In comparison to the project-specific action levels for porous exterior surfaces, both results were below the lower project-specific action level of 8 μg/100cm^2.

The two caulking surface wipe samples were reported at 850 μg/100cm^2 (hexane wipe) and 74 μg/100cm^2 (saline wipe). While these results were reported in exceedance of the project-specific action levels, no immediate actions were undertaken given that the caulking is scheduled to be removed in 2010. In addition, it was determined that the exposure potential to this surface was limited due to: (a) the small size of the joint (a half-inch wide bead); (b) the likely lack of outdoor balcony use during winter months; and (c) limited direct contact with this location given its position at the bottom of the wall surface adjacent to the concrete pad.

Exterior Concrete Patios and Balconies: Bulk Data

Bulk concrete samples were collected from three types of horizontal concrete surfaces at Building A – two patios (Units 22-11 and 18-12), one balcony underside (Unit 18-22, accessed from the Unit 18-21 patio), and one balcony topside (Unit 21-31). Thirteen of these fifteen samples were reported with detectable levels of PCBs, with all eight patio surface samples reported as ≤ 1 ppm, two of which were non-detect.

While two of the three balcony underside samples were reported below 1 ppm (average 0.90 ppm), the third sample (collected within 0.5 inches of the caulking joint at the wall) was reported at 36.1 ppm. The samples collected from the topside of a balcony surface were reported at 2.53 and 21.4 ppm for the random concrete locations away from the caulked joint, at 124 ppm for the concrete within 0.5 inches of the balcony caulking joint, and at 4,430 ppm for the (inaccessible) concrete in direct contact with the balcony caulking joint. As described in the Remediation Plan for Building A, all bulk concrete samples reported in exceedance of the 1 ppm threshold will be subject to remedial activities.

The bulk caulking samples collected from the Building A first floor patio joints were reported with PCB levels of 27.8 ppm (Unit 18-12) and 64.9 ppm (Unit 22-11), indicating that this caulking has been impacted by the caulking formerly in place at that joint prior to the ground-floor patio pads' replacement. The bulk caulking sample from the Unit 21-31 balcony contained PCBs reported at 139,000 ppm. This result is consistent with the level of PCBs reported in the direct contact concrete sample, and falls within the range of expected PCB concentrations given previous sample data from original Building A caulking. The remediation of these materials is addressed in the Building A Remediation Plan.

Indoor Air

To evaluate the exposure potential from indoor air within residential units, two indoor air samples were collected for PCB analysis from each of two Building A units. Samples were collected from the bedroom and the living room / kitchen area of Units 18-12 and 20-12 to supplement the existing bulk sample and surface wipe data collected from these units. In addition, one ambient outdoor air sample was collected from the courtyard west of Building A for background comparison to indoor air concentrations.

Analytical results from these samples were reported with total PCB homologs at a concentration of 22.3 nanograms (ng) per cartridge in the outdoor air sample, and at concentrations ranging from 22.8 to 34.0 ng/cartridge in the indoor air samples. Using the methods outlined in section 13 of the Method TO-10A guidance, the cartridge sample volumes were calculated by factoring in the sample collection flow rate, sample duration, and the average ambient atmospheric information at the time of sample collection. Converting the reported results to units of nanograms per cubic meter (ng/m^3) for the purposes of comparison to action levels, the total PCB homolog concentrations were reported at 67.5 ng/m^3 in the background outdoor air and at concentrations ranging from 68.0 to 100.8 ng/m^3 in the indoor air. The average concentration in each of the two residential units was found to be 97.9 ng/m^3 in Unit 18-12 and 72.3 ng/m^3 in Unit 20-12. In comparison to the action levels developed for indoor air, these results were all reported below the most stringent action level of 140 ng/m^3.

Conclusions

Based on the existing data set (interior surface wipes, exterior surface wipes, and indoor air) and EPA's recent guidance and standard practice for PCBs in caulking, no immediate actions or temporary measures are suggested for any interior or exterior materials associated with residential units at this time.

As indicated in the preface to this memorandum, the interior accessible surfaces represent those with the highest exposure potential relative to caulking materials and exterior accessible surfaces (such as patios, balconies). The frequency of detection of PCBs in the hexane surface wipe samples collected from interior accessible surfaces was very low, 3 out of 27 samples. None of the three detected concentrations exceeded the lowest of the project-specific action levels. As hexane wipes most likely overestimate the amount of PCBs which can be transferred to skin, it is concluded that these interior walls and floors do not pose a health hazard.

The interior caulking is replacement caulking installed in the 1990s and is excellent condition (intact, not brittle or deteriorating). Interior caulking wipes were reported with PCB concentrations exceeding action levels at some locations. However, the bead of caulking around the door/window has limited accessibility compared to all the other surfaces within the apartment unit. In addition, if the surface were contacted, only a small portion of the hand would be in direct contact with the caulking, so the amount transferred would be very small. Additionally, saline wipe data, which are likely more representative of the available PCB fraction for dermal contact over the short term relative to the stronger extractant of hexane, were non-detect for interior caulking wipes.

Exterior caulking was found to contain elevated levels of PCBs and is scheduled for removal. In the interim, the exposure potential to this surface is limited due to: (a) the small size of the joint (a half-inch wide bead); and (b) limited direct contact with this location given its position at the bottom of the wall surface adjacent to the concrete pad. As such, no immediate actions are warranted before remedial actions can be completed.

Indoor air samples collected from two Building A units (4 samples total) were all reported below the most stringent action level for total PCBs (140 ng/m^3), with the maximum concentration reported at 101 ng/m^3. In addition, these results were comparable to the ambient outdoor air (background) sample, which was reported with a total PCB concentration of 67.5 ng/m^3.

Given the results presented herein, additional immediate actions or interim measures are not warranted. The PCBs detected in the various media are not likely to pose an unacceptable risk to tenants before remedial actions can be completed given the schedule proposed for remedy implementation.

Table A-1
Residential Unit Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Exterior Bulk Caulking - Ground Level Patios (Results in mg/kg)					
PTA-CBK-1812-0332	West façade 18-12 patio caulking at the pad to building face joint (ground level); light gray replacement caulking	12/08/09	27.8	1.52	J
PTA-CBK-2211-0341	West façade 18-12 patio caulking at the pad to building face joint (ground level); light gray replacement caulking	12/08/09	64.9	5.21	
Exterior Caulking Wipes - Ground Level Patios (Results in ug/100cm^2)					
PTA-CWK-1812-0178	Patio window joint (vertical section, left) hexane wipe	10/13/09	8.3	0.5	
PTA-CWK-1812-0179	Patio window joint (vertical section, left) saline wipe	10/13/09	0.7	0.5	
PTA-CWK-1812-0181	Patio concrete wall joint, saline wipe	10/13/09	1.7	0.5	
PTA-CWK-1812-0182	Patio concrete wall joint, hexane wipe	10/13/09	5.3	0.5	
PTA-CWK-2012-0188	Patio door joint (vertical section, right) hexane wipe	10/13/09	2.0	0.5	
PTA-CWK-2012-0189	Patio door joint (vertical section, right) saline wipe	10/13/09	ND	0.5	
PTA-CWK-2012-0190	Patio concrete wall joint, saline wipe	10/13/09	0.9	0.5	J
PTA-CWK-2012-0191	Patio concrete wall joint, hexane wipe	10/13/09	ND	0.5	
PTA-CWK-2211-0198	Patio door joint (vertical section, left) saline wipe	10/13/09	0.7	0.5	J
PTA-CWK-2211-0199	Patio door joint (vertical section, left) hexane wipe	10/13/09	0.9	0.5	J
PTA-CWK-2211-0201	Patio concrete wall joint, saline wipe	10/13/09	3.7	0.5	
PTA-CWK-2211-0202	Patio concrete wall joint, hexane wipe	10/13/09	1.7	0.5	
Exterior Bulk Caulking - Upper Floor Balconies (Results in mg/kg)					
PTA-CBK-2131-0337	West façade 21-31 balcony caulking at the pad to building face joint; dark gray original caulking	12/08/09	139,000	6.37	J
Exterior Caulking Wipes - Upper Floor Balconies (Results in ug/100cm^2)					
PTA-CWK-2131-0364	Balcony concrete wall joint at unit 21-31, hexane wipe, adj to bulk sample -0337	12/22/09	850	50	J
PTA-CWK-2131-0365	Balcony concrete wall joint at unit 21-31, saline wipe	01/12/10	74	5	

Table A-1
Residential Unit Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Exterior Bulk Concrete - Ground Level Patios (Results in mg/kg)					
PTA-CBC-2211-0224	Unit 22-11 Patio, 2.25' from east and 4.0' from south edges	10/22/09	0.056	0.033	
PTA-CBC-2211-0225	Unit 22-11 Patio, 4.5' from east and 2.0' from north edges; flush with overhang	10/22/09	ND	0.033	
PTA-CBC-2211-0226	Unit 22-11 Patio, within 0.5 inches of the pad/wall joint	10/22/09	0.867	0.033	
PTA-CBC-2211-0227	Unit 22-11 Patio, direct contact sample (depth of joint)	10/22/09	0.34	0.033	
PTA-CBC-1812-0231	Unit 18-12 Patio, 2.0' from east and 4.5' from south edges	10/22/09	0.07	0.033	J
PTA-CBC-1812-0232	Unit 18-12 Patio, 4.5' from east and 2.25' from north edge; flush with overhang	10/22/09	ND	0.033	
PTA-CBC-1812-0230	Unit 18-12 Patio, within 0.5 inches of the pad/wall joint	10/22/09	0.529	0.033	
PTA-CBC-1812-0229	Unit 18-12 Patio, direct contact sample (depth of joint)	10/22/09	0.479	0.033	
Exterior Concrete Surface Wipes - Ground Level Patios (Results in ug/100cm^2)					
PTA-CWC-1812-0180	Concrete wall between Unit 18-12 patio window and door	10/13/09	ND	0.5	
PTA-CWC-1812-0183	Concrete pad surface in front of Unit 18-12 patio window	10/13/09	ND	0.5	
PTA-CWC-2012-0193	Concrete pad surface in front of Unit 20-12 patio door	10/13/09	ND	0.5	
PTA-CWC-2012-0194	Concrete wall between Unit 20-12 patio window and door	10/13/09	ND	0.5	
PTA-CWC-2211-0203	Unit 22-11 concrete pad surface beneath face of overhanging balcony	10/13/09	ND	0.5	
PTA-CWC-2211-0204	Concrete wall south of the patio door of Unit 22-11.	10/13/09	ND	0.5	
Exterior Bulk Concrete - Upper Floor Balconies (Results in mg/kg)					
PTA-CBC-1812-0233	1822 Balcony underside, 4.0' from north edge, 1.0' from west (outer) edge	10/22/09	1.07	0.033	
PTA-CBC-1812-0234	1822 Balcony underside, 3.0' from south edge, 1.5' from east (inner) edge	10/22/09	0.728	0.033	
PTA-CBC-1812-0235	1822 Balcony underside	10/22/09	36.1	3.27	
PTA-CBC-2131-0333	Random location (3' from building face)	12/08/09	2.53	0.17	
PTA-CBC-2131-0334	Random location (1' from building face)	12/08/09	21.4	1.68	
PTA-CBC-2131-0335	0-0.5 inches from joint (balcony slab surface)	12/08/09	124	6.7	
PTA-CBC-2131-0336	Direct contact with joint (vertical wall surface)	12/08/09	4,430	167	
Exterior Concrete Surface Wipes - Upper Floor Balconies (Results in ug/100cm^2)					
PTA-CWC-2131-0362	Unit 21-31 balcony; concrete surface wipe adjacent to bulk sample location PTA-CBC-2131-0333	12/22/09	ND	0.5	
PTA-CWC-2131-0363	Unit 21-31 balcony; concrete surface wipe adjacent to bulk sample location PTA-CBC-2131-0334	12/22/09	5.9	0.5	

Table A-1
Residential Unit Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Residential Unit Interior Bulk Caulking (Results in mg/kg)					
PTA-CBK-1812-0177	Unit 18-12 bedroom window joint (vertical section, right)	10/13/09	223	12.6	
PTA-CBK-2012-0187	Unit 20-12 living room window joint (vertical section, right)	10/13/09	61.5	3.99	
PTA-CBK-2211-0197	Unit 22-11 living room door joint (vertical section, right)	10/13/09	18.9	1.06	J
Residential Unit Interior Caulking Wipes (Results in ug/100cm^2)					
PTA-CWK-2211-0035	Living room window joint (horizontal section, bottom); hexane wipe	09/10/09	2.6	0.5	
PTA-CWK-2211-0036	Living room door joint (vertical); hexane wipe	09/10/09	2.8	0.5	
PTA-CWK-2211-0037	Bedroom window joint (horizontal section, top); hexane wipe	09/10/09	ND	0.5	
PTA-CWK-2021-0048	Living room door joint (vertical); hexane wipe	09/10/09	0.9	0.5	
PTA-CWK-2021-0049	Living room window joint (horizontal section, top); hexane wipe	09/10/09	2.6	0.5	
PTA-CWK-2021-0050	Bedroom window joint (vertical); hexane wipe	09/10/09	8.6	0.5	
PTA-CWK-1812-0058	Living Room window joint (vertical); hexane wipe	09/10/09	3.6	0.5	
PTA-CWK-1812-0061	Living room door joint (vertical); hexane wipe	09/10/09	1.0	0.5	
PTA-CWK-1812-0066	Bedroom window joint (vertical); hexane wipe	09/10/09	5.4	0.5	
PTA-CWK-2211-0083	Follow up after surficial cleaning, living room window joint (horizontal section, bottom); hexane wipe	09/22/09	1.1	0.5	
PTA-CWK-2211-0084	Follow up after surficial cleaning, living room door joint (vertical); hexane wipe	09/22/09	0.5	0.5	
PTA-CWK-2211-0085	Follow up after surficial cleaning, bedroom window joint (horizontal section, top); hexane wipe	09/22/09	1.3	0.5	
PTA-CWK-1812-0086	Follow up after surficial cleaning, living room window joint (vertical); hexane wipe	09/22/09	1.6	0.5	
PTA-CWK-1812-0087	Follow up after surficial cleaning, living room door joint (vertical); hexane wipe	09/22/09	ND	0.5	
PTA-CWK-1812-0088	Follow up after surficial cleaning, bedroom window joint (vertical); hexane wipe	09/22/09	5.6	0.5	
PTA-CWK-1812-0168	Bedroom window joint (vertical section, right); isopropyl alcohol wipe	10/01/09	29	3	
PTA-CWK-1812-0169	Bedroom window joint (vertical section, right); saline wipe	10/01/09	ND	0.5	
PTA-CWK-1812-0170	Bedroom window joint (vertical section, right); hexane wipe	10/01/09	21	3	
PTA-CWK-2012-0185	Living room window joint (vertical section, right) saline wipe	10/13/09	ND	0.5	
PTA-CWK-2012-0186	Living room window joint (vertical section, right); hexane wipe	10/13/09	2.2	0.5	
PTA-CWK-2211-0195	Living room door joint (vertical section, right); saline wipe	10/13/09	ND	0.5	
PTA-CWK-2211-0196	Living room door joint (vertical section, right); hexane wipe	10/13/09	0.8	0.5	J

Table A-1
Residential Unit Characterization Data
Peabody Terrace Remediation Plan

Sample ID	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Residential Unit Interior Adjacent Surface Wipes (Results in ug/100cm^2)					
PTA-CWC-2211-0043	Living room north wall; hexane wipe	09/10/09	2.5	0.5	J
PTA-CWC-2021-0055	Living room south wall; hexane wipe	09/10/09	2.1	0.5	
PTA-CWC-1812-0059	Living room south wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWD-2211-0041	Bedroom desk; hexane wipe	09/10/09	ND	0.5	
PTA-CWD-2021-0052	Painted wood step leading to balcony; hexane wipe	09/10/09	ND	0.5	
PTA-CWD-1812-0067	Bedroom desk; hexane wipe	09/10/09	ND	0.5	
PTA-CWM-2211-0038	Living room radiator under window; saline wipe	09/10/09	ND	0.5	
PTA-CWM-2211-0039	Bedroom window frame (horizontal section, top); saline wipe	09/10/09	ND	0.5	UJ
PTA-CWM-2211-0044	Bedroom radiator under desk; saline wipe	09/10/90	ND	0.5	
PTA-CWM-2021-0053	Bedroom window frame (vertical section); saline wipe	09/10/09	ND	0.5	
PTA-CWM-2021-0057	Living room door frame (vertical section); saline wipe	09/10/09	ND	0.5	
PTA-CWM-1812-0060	Living room window frame (horizontal section, bottom); saline wipe	09/10/09	ND	0.5	
PTA-CWM-1812-0062	Living room door frame (vertical section); saline wipe	09/10/09	ND	0.5	
PTA-CWT-2211-0032	Bedroom floor; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2211-0033	Living room floor near door; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2211-0034	Living room floor near kitchen; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2021-0045	Living room floor near door; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2021-0046	Hallway floor near kitchen; saline wipe	09/10/09	ND	0.5	
PTA-CWT-2021-0047	Bedroom floor; saline wipe	09/10/09	ND	0.5	
PTA-CWT-1812-0064	Living room floor near window; saline wipe	09/10/09	ND	0.5	
PTA-CWT-1812-0065	Kitchen floor; saline wipe	09/10/09	ND	0.5	
PTA-CWT-1812-0068	Bedroom floor; saline wipe	09/10/09	ND	0.5	
PTA-CWW-2211-0042	Living room south wall; hexane wipe	09/10/09	0.5	0.5	
PTA-CWW-2021-0054	Living room north wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWW-2021-0056	Bedroom south wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWW-1812-0063	Living room north wall; hexane wipe	09/10/09	ND	0.5	
PTA-CWW-1812-0069	Bedroom west wall; hexane wipe	09/10/09	ND	0.5	
Residential Unit Indoor Air (Total PCB Homolog results in ng/m^3)					
PTA-CAR-1812-0370	Building A Unit 18-12 Living Room	02/02/10	105.7	15	
PTA-CAR-1812-0371	Building A Unit 18-12 Bedroom	02/02/10	112.2	15	
PTA-CAR-2012-0373	Building A Unit 20-12 Living Room	02/02/10	85.3	15	
PTA-CAR-2012-0374	Building A Unit 20-12 Bedroom	02/02/10	75.7	15	J
PTA-CAR-W-0372	Outdoor (background) sample - courtyard west of Building A, south of Building B	02/02/10	75.1	15	

Notes:
1. All bulk and wipe samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. Air samples collected per USEPA Compendium Method TO-10A and submitted for analysis of PCB homologs
3. All sample results are presented in units as indicated in each section header.
4. All wipe samples were collected from 100 cm^2 areas using wipes provided by the laboratory, preserved as indicated.
5. ND = Not detected above laboratory's minimum reporting limit, as indicated.
6. J or UJ = Value is estimated based on data validation.

Technical Memorandum: Daycare & Common Area Characterization Data

This summary memorandum has been prepared to consolidate the results from PCB samples collected from Peabody Terrace daycares, interior & exterior common areas, and play areas. These samples were collected to assess potential PCB exposures from caulking and other potential exposure areas for children using these facilities. At this time, samples have been collected from the following areas:

- Bulk samples of exterior materials in designated play areas adjacent to Building D;
- Surface wipe samples of exterior caulking and accessible surfaces in play areas adjacent to Building D;
- Surface wipe samples from interior caulking and accessible surfaces in Building D, E, and F daycares and/or common areas; and,
- Bulk soil samples from higher potential exposure areas at designated play areas and in lawns adjacent to ground-floor residential units.

The exposure pathways with the highest potential for PCB exposures to children using Peabody Terrace daycare facilities are direct contact and, to a lesser extent, inhalation of particulate matter / dust. With regard to direct contact, this exposure pathway relates to the dermal or direct contact with surfaces that may contain PCBs followed by ingestion through hand to mouth contact. With regard to inhalation of PCB containing dust / particulate matter, similar potential routes of transport and exposure exist for this pathway as those described above for the direct contact pathway; however, the exposure route is via inhalation of dust/particulate matter emanating from a surface rather than skin contact and ingestion.

The following sections summarize the sample data collected from Peabody Terrace daycares and adjacent play areas, and compare concentrations to action levels (as presented in the attached Technical Memorandum: Surface Wipe, Soil, and Indoor Air Action Levels). A summary table of the data is presented on the attached Table A-2.

Exterior Bulk and Surface Wipe Samples

Eight exterior bulk material samples were collected from accessible locations within designated play areas adjacent to the south side of Building D daycares. Samples included play sand (4), soils (3), and a black sealant material (1) located on the ground surface between asphalt and a rubber play mat.

Of the eight bulk samples collected from exterior materials, all four play sand sample results were reported as non-detect (ND) for PCBs, and low levels of PCBs were reported in the soils (0.12 – 0.31 mg/kg). The black sealant material was reported with PCBs at 0.67 mg/kg. No response actions were taken in these play areas as a result of the exterior bulk samples. Summary statistics for the exterior bulk samples are presented below.

Sample Type	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Exterior Bulk Materials	8	4/8 (50%)	ND - 0.67	0.17

Note: All results are presented in mg/kg.

In addition to the bulk samples collected from the Building D exterior play areas (referred to as Play Areas 1 and 2), another 13 soil samples were collected among four additional fenced exterior play areas at the Site (referred to as Play Areas 3, 4, 5, and 6). Data reported from these play areas was similar to the results seen at Play Areas 1 and 2, with the exception of two soil results reported above the 1 ppm action level in Play Area 6, west of Building Z.

As a result, a temporary measure was implemented in this area to prevent access to the > 1 ppm soils until further characterization activities could be completed. The temporary measure involved the installation of a complete layer of landscaping fabric and a new four-inch thick layer of mulch across the entire play area, as shown by the mulch ground surface indicator on the Site Plan (Figure 1-2 in the Remediation Plan). With the exception of the Play Area 6 soil results (two samples > 1 and one sample nearing 1 ppm), the arithmetic mean value for bulk samples collected from designated play areas is 0.26 ppm (18 samples).

Lawn Area Soil Samples

Ten soil samples were collected from four lawn areas adjacent to Buildings A, B, E, and F as these areas were determined to have a higher potential for exposure given the PCB transport pathway and the areas' accessibility by patio entrances. All soil samples were collected from 0 to 3 inches below ground surface. Detectable levels of PCBs were reported in all 10 soil samples, ranging in concentration from 0.23 to 3.29 ppm. In comparison to the project-specific action levels, detected PCB concentrations in lawn areas adjacent to Building A, B, and E were in excess of the lowest project-specific action level of 1 ppm. Because these soils are grass covered and given the low concentrations, no interim actions were taken pending further characterization data collection.

Exterior Surface Wipe Samples

A total of 16 exterior surface wipe samples were collected from caulking (10) and other accessible surfaces (6) in the play areas adjacent to the south side of Building D daycares. After results from the initial hexane-wipe sampling activities were reported with caulking surface wipe concentrations ranging between 7.4 and 104 micrograms per 100 square centimeters (ug/100cm^2) and adjacent surface wipe concentrations ranging from ND to 1.3 ug/100cm^2, interim measures were implemented in the form of temporary barriers to restrict access to caulking and concrete wall surfaces (new caulking over existing window caulking; a new silicone strip/seal over existing building joint caulking: and a clear acrylic coating over the concrete walls in the play areas). Summary statistics for the exterior wipe samples are presented below.

Sample Type	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Exterior Caulking (Hexane)	2	2/2 (100%)	7.4 – 104	55.7
Exterior Accessible Surfaces (Hexane)	4	1/4 (25%)	ND – 1.3	0.51

Note: All results are presented in micrograms per 100 cm^2 (µg/100 cm^2).

After the temporary barriers were installed, surface wipe samples were collected from the covered caulking and concrete wall surfaces using hexane-preserved wipes (September 24, 2009) and also from caulking using saline-preserved wipes (October 1, 2009). The hexane-wipe samples of caulking in each play area were reported with lower PCB concentrations than the levels reported before barrier installation, and the concrete wipe samples were reported as < 0.5 ug/100cm^2. In addition, still lower concentrations of PCBs were reported from the exterior caulking when saline-preserved wipes were used; the saline wipes are believed to be more representative of direct contact transfer and/or conditions on the surface of the barrier. Summary statistics for the exterior wipe samples collected after barrier installation are presented in the table below.

Sample Type	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Exterior Caulking (Hexane Wipe)	6	6/6 (83%)	1.8 – 36	14.2
Exterior Caulking (Saline Wipe)	2	1/2 (50%)	ND – 1.2	0.73
Exterior Accessible Surfaces	2	0/2 (0%)	ND	ND

Note: All results are presented in micrograms per 100 cm^2 (µg/100 cm^2).

In consideration of the project-specific action levels for exterior porous surfaces in high contact areas (lower action level of 8 µg/100 cm^2 and upper action level of 38 µg/100 cm^2), there was one exceedance of the upper action level prior to barrier installation. While hexane-preserved wipe sample results from caulked surfaces continued to be reported above the lower action level after barrier installation, the saline-preserved wipe sample results indicated that although PCBs are present in the material, they are not likely to be available for direct contact exposures at significant concentrations.

Interior Caulking and Surface Wipes

Seventy surface wipe samples were collected from each of five Peabody Terrace daycares / play rooms (Building D Infant/Toddler Childcare, Building D Toddler/Preschooler Childcare, Building D Play Room, Building E Common Room, and Building F Childcare) to assess interior caulking, interior surfaces adjacent to caulking, lower walls, and floors. Of note, the interior window and door caulking within these areas was different than that observed within residential units (i.e., windows and doors were of a different type and contained different interior caulking than Building A units).

All daycare and play room interior surface wipe samples were collected from accessible surfaces using a hexane-preserved wipe over a 100 cm^2 sample area. Twenty-seven samples were collected from interior caulking and 43 samples were collected from adjacent surfaces. Three of the 27 interior caulking wipe samples contained reportable concentrations of PCBs ranging from 1.7 to 4.3 µg/100cm^2, and one of the 43 adjacent surface locations was reported with detectable concentrations of PCBs at 3.1 ug/100cm^2. Summary statistics for interior wipe samples using hexane are presented in the table below.

Sample Type	Number of Samples	Frequency of Detection	Range Detected	Arithmetic Mean
Interior Caulking (Hexane)	27	3/27 (11%)	1.7 – 4.3	0.57
Interior Accessible Surfaces (Hexane)	43	1/43 (2%)	ND – 3.1	0.32

Notes: All results are presented in micrograms per 100 cm^2 (µg/100 cm^2).
Arithmetic mean was calculated using one-half the laboratory reporting limit where ND.

In comparison to the project-specific action levels, no samples of adjacent surfaces were reported above project-specific action levels. Two of the 3 caulking samples with detectable concentrations of PCBs were reported at or above the lower project-specific action level of 3.3 µg/100cm^2. One sample of a horizontal caulking joint between the west wall and ceiling of the Building F daycare was reported at 4.3 ug/100cm^2, and a sample of a unique window caulking joint in the kitchen adjacent to the Building E Common Room was reported with PCBs at 3.3 ug/100cm^2.

Conclusions

The data indicates that although low levels of PCBs are present in some samples, they are not likely to be available for direct contact exposures to children using the daycare facilities and adjacent play areas given the low concentrations and intact nature of the caulking (i.e., not brittle or deteriorating). The vast majority of caulking and adjacent surface wipes were reported as non-detect for PCBs (66 out of 70 samples), and the caulking samples reported with detectable levels of PCBs just above the lower (more stringent) action level were collected from areas that are not likely to be accessed by children (painted ceiling/wall areas). Based on the existing data set and EPA's recent guidance and standard practice for PCBs in caulking, no additional immediate actions or temporary measures are suggested for any interior or exterior caulking associated with daycares or common areas at this time. However, the remediation of soils, exterior caulking, and exterior building surfaces will be conducted during the upcoming remedial activities at the Site. In the interim, inspection and monitoring (and additional corrective measures if needed) will be performed in these areas where interim measures have been performed.

Table A-2
Daycare & Common Area Characterization Data
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Sample ID	Media	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Exterior Bulk Samples - Lawns Adjacent to Ground Floor Units (Results in mg/kg)						
PTA-CBS-W-0071	Soil	Lawn west of Bldg A	9/10/09	1.91	0.079	
PTA-CBS-W-0072	Soil	Lawn west of Bldg A	9/10/09	1.64	0.086	
PTA-CBS-W-0073	Soil	Lawn west of Bldg A	9/10/09	1.08	0.043	
PTB-CBS-S-0074	Soil	Lawn south of Bldg B	9/10/09	1.15	0.040	
PTB-CBS-S-0075	Soil	Lawn south of Bldg B	9/10/09	0.23	0.040	
PTE-CBS-W-0076	Soil	Lawn west of Bldg E	9/10/09	1.05	0.043	
PTE-CBS-W-0077	Soil	Lawn west of Bldg E	9/10/09	3.24	0.200	
PTE-CBS-W-0078	Soil	Lawn west of Bldg E	9/10/09	3.29	0.170	
PTF-CBS-S-0079	Soil	Lawn south of Bldg F	9/10/09	0.935	0.043	
PTF-CBS-S-0080	Soil	Lawn south of Bldg F	9/10/09	0.775	0.046	
Exterior Bulk Samples - Designated Play Areas (Results in mg/kg)						
PTD-CBN-PA01-0003	Sand	Adjacent to southern exterior wall of Building D	9/10/09	ND	0.033	
PTD-CBN-PA01-0004	Sand	Adjacent to southern exterior wall of Building D	9/10/09	ND	0.033	
PTD-CBN-PA01-0005	Sand	Near southern play area fence south of Bldg D	9/10/09	ND	0.033	
PTD-CBN-PA02-0008	Sand	In play area sand box south of Building D	9/10/09	ND	0.033	
PTY-CBN-PA03-0017	Sand	Tot Lot sand south of play area walkway	9/10/09	0.053	0.033	
PTY-CBN-PA03-0018	Sand	Tot Lot sand north of play area walkway	9/10/09	ND	0.033	
PTF-CBN-PA04-0020	Sand	In play area sand box north of Building F	9/10/09	ND	0.033	
PTE-CBN-PA05-0025	Sand	In play area sand box along western area fence	9/10/09	ND	0.033	
PTD-CBS-PA01-0001	Soil	Base of tree in fenced area	9/10/09	0.210	0.033	
PTD-CBS-PA01-0002	Soil	Base of tree in fenced area	9/10/09	0.117	0.036	
PTD-CBS-PA02-0007	Soil	Base of tree in fenced area	9/10/09	0.310	0.050	
PTY-CBS-PA03-0015	Soil	Exposed dirt along western fence near large tree	9/10/09	0.417	0.036	J
PTY-CBS-PA03-0016	Soil	Grass area east of sand and play equipment	9/10/09	0.345	0.036	
PTF-CBS-PA04-0021	Soil	Exposed dirt along northern fence witin play area	9/10/09	0.279	0.040	
PTE-CBS-PA05-0022	Soil	Grass area near northern fence gate	9/10/09	0.069	0.036	
PTE-CBS-PA05-0023	Soil	Grass area near eastern fence gate	9/10/09	ND	0.036	
PTE-CBS-PA05-0024	Soil	Grass area in southern portion of fenced area	9/10/09	ND	0.033	
PTZ-CBS-PA06-0026	Soil	Exposed soils in front of northern bench east of play area	9/10/09	0.963	0.036	J
PTZ-CBS-PA06-0027	Soil	Exposed soils in front of southern bench east of play area	9/10/09	1.886	0.073	
PTZ-CBS-PA06-0028	Soil	Mulched soils at base of slide in play area	9/10/09	2.49	0.130	J
PTD-CBK-PA01-0006	Caulking	Black caulking at rubber/asphalt seam	9/10/09	0.667	0.230	

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Sample ID	Media	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Exterior Surface Wipe Samples (Results in ug/100cm^2)						
PTD-CWK-PA01-0009	Caulking	Bldg D southern exterior wall within fenced area; hexane wipe	9/10/09	7.4	0.5	
PTD-CWK-PA01-0089	Caulking	Surface of encapsulant over PTD-CWK-PA01-0009, hexane wipe	09/24/09	1.8	0.5	
PTD-CWK-PA01-0091	Caulking	Surface of white caulking encapsulant over window joint 1 foot east of PTD-CWK-PA01-0089; hexane wipe	09/24/09	13	1	
PTD-CWK-PA01-0174	Caulking	Surface of white caulking encapsulant over window joint, isopropy alcohol wipe	10/01/09	9.1	0.5	
PTD-CWK-PA01-0175	Caulking	Surface of white caulking encapsulant over window joint, saline wipe	10/01/09	ND	0.5	
PTD-CWK-PA01-0176	Caulking	Surface of white caulking encapsulant over window joint; hexane wipe	10/01/09	9.2	0.5	
PTD-CWK-PA02-0012	Caulking	Bldg D southern exterior wall within fenced area; hexane wipe	9/10/09	104	2	
PTD-CWK-PA02-0092	Caulking	Surface of encapsulant over PTD-CWK-PA02-0012, hexane wipe	09/24/09	12	1	
PTD-CWK-PA02-0171	Caulking	Surface of bronze-colored silicone encapsulant over concrete wall joint, isopropyl alcohol wipe	10/01/09	38	3	
PTD-CWK-PA02-0172	Caulking	Surface of bronze-colored silicone encapsulant over concrete wall joint, saline wipe	10/01/09	1.2	0.5	
PTD-CWK-PA02-0173	Caulking	Surface of bronze-colored silicone encapsulant over concrete wall joint, hexane wipe	10/01/09	36	3	
PTD-CWK-PA02-0094	Caulking	Surface of white caulking encapsulant over window joint 1 foot west of PTD-CWK-PA02-0092; hexane wipe	09/24/09	13	1	
PTD-CWC-PA01-0010	Concrete	Bldg D southern exterior wall within fenced area; hexane wipe	9/10/09	ND	0.5	
PTD-CWC-PA01-0090	Concrete	Surface of clear coat water repellant over PTD-CWC-PA01-0010; hexane wipe	09/24/09	ND	0.5	
PTD-CWC-PA02-0013	Concrete	Bldg D southern exterior wall within fenced area; hexane wipe	9/10/09	1.3	0.5	
PTD-CWC-PA02-0093	Concrete	Surface of clear coat water repellant over PTD-CWC-PA02-0013; hexane wipe	09/24/09	ND	0.5	
PTD-CWP-PA01-0011	Play Mat	Central rubber mat surface in fenced area; hexane wipe	9/10/09	ND	0.5	
PTD-CWP-PA02-0014	Play Mat	Rubber mat surface in fenced area near entry; hexane wipe	9/10/09	ND	0.5	
PTF-CWP-PA04-0019	Play Mat	Rubber mat surface in center of area; hexane	9/10/09	ND	0.5	
Daycare / Play Area Interior Caulking Wipes (Results in ug/100cm^2)						
PTF-CWK-DC03-0095	Caulking	Vertical caulking joint at main entrance door, north wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWK-DC03-0096	Caulking	Vertical caulking joint btw window and concrete column, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWK-DC03-0101	Caulking	Horizontal caulking joint beneath operable window, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWK-DC03-0104	Caulking	Vertical caulking joint btw window and concrete column, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWK-DC03-0108	Caulking	Vertical caulking joint btw window and concrete wall, north wall of Toddler 1 South; hexane wipe	09/28/09	ND	0.5	

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Sample ID	Media	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Daycare / Play Area Interior Caulking Wipes continued (Results in ug/100cm^2)						
PTF-CWK-DC03-0112	Caulking	Vertical caulking joint between concrete panels at north wall entrance area; hexane wipe	09/28/09	1.7	0.5	
PTF-CWK-DC03-0113	Caulking	Horizontal caulking joint beneath operable window, north wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWK-DC03-0114	Caulking	Vertical caulking joint along door in westernmost room; hexane wipe	09/28/09	ND	0.5	
PTF-CWK-DC03-0118	Caulking	Horizontal caulking joint btw ceiling and western concrete wall; hexane wipe	09/28/09	4.3	0.5	
PTD-CWK-DC01-0120	Caulking	Vertical caulking window joint on southern wall, adj to concrete wall. Caulking is very squishy, painted; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC01-0123	Caulking	Horizontal caulking joint beneath operable window, south wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC01-0124	Caulking	Vertical caulking joint at entrance door, south wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC01-0126	Caulking	Vertical caulking joint along window, west wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC01-0128	Caulking	Vertical caulking window joint on northern wall, adj to concrete column; caulking is painted. Hexane wipe.	09/28/09	ND	0.5	
PTD-CWK-DC02-0133	Caulking	Vertical caulking joint btw window and concrete column, south wall of western room; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC02-0135	Caulking	Horizontal caulking joint beneath operable window, south wall of western room; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC02-0137	Caulking	Vertical caulking door joint on southern wall, adj to southern entrance. Caulking is very squishy; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC02-0141	Caulking	Vertical caulking on north wall, adj to concrete; caulking is painted; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-DC02-0144	Caulking	Horizontal caulking joint beneath operable window, north wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWK-CR01-0145	Caulking	Vertical caulking window joint on western wall , adj to concrete wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWK-CR01-0151	Caulking	Vertical caulking joint btw window and concrete column, east wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWK-CR01-0153	Caulking	Horizontal caulking joint beneath window, east wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWK-CR01-0157	Caulking	Vertical caulking window joint on western wall in kitchen, adj to concrete column; hexane wipe	09/28/09	3.3	0.5	
PTD-CWK-PR01-0158	Caulking	Vertical caulking joint btw window and concrete column, south wall;hexane wipe	09/28/09	ND	0.5	
PTD-CWK-PR01-0161	Caulking	Horizontal caulking joint beneath operable window, south wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-PR01-0163	Caulking	Vertical caulking joint btw window and concrete column, north wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWK-PR01-0166	Caulking	Horizontal caulking joint beneath operable window, north wall; hexane wipe	09/28/09	ND	0.5	

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Sample ID	Media	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Daycare / Play Area Interior Adjacent Surface Wipes (Results in ug/100cm^2)						
PTF-CWC-DC03-0097	Concrete	Concrete column adjacent to a window, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWC-DC03-0105	Concrete	Concrete column adjacent to a window, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWC-DC03-0109	Concrete	Concrete wall west of northen windows in Toddler 1 South; hexane wipe	09/28/09	ND	0.5	
PTF-CWC-DC03-0115	Concrete	Concrete wall in northeast corner of westernmost room; hexane wipe	09/28/09	ND	0.5	
PTD-CWC-DC01-0121	Concrete	Concrete wall adjacent to windows, southwest corner; hexane wipe	09/28/09	ND	0.5	
PTD-CWC-DC01-0130	Concrete	Concrete column adjacent to a window, north wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWC-DC02-0134	Concrete	Concrete column adjacent to windows, south wall western room; hexane wipe	09/28/09	ND	0.5	
PTD-CWC-DC02-0142	Concrete	Concrete column adjacent to a window, north wall eastern room; hexane wipe	09/28/09	ND	0.5	
PTE-CWC-CR01-0146	Concrete	Concrete wall adjacent to windows, western wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWC-CR01-0152	Concrete	Concrete column adjacent to a window, east wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWC-PR01-0165	Concrete	Concrete column adjacent to windows, north wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWD-DC03-0106	Wood	Horizontal surface of wooden bench adjacent to windows, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWD-DC03-0110	Wood	Horizontal surface of wooden bench adjacent to windows, Toddler 1 South; hexane wipe	09/28/09	ND	0.5	
PTF-CWD-DC03-0117	Wood	Wooden desk below window in NE corner of western room; hexane wipe	09/28/09	ND	0.5	
PTD-CWD-DC01-0122	Wood	Horizontal surface of wooden bench adjacent to windows, south wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWD-DC01-0127	Wood	Horizontal surface of wooden bench below west window; hexane wipe	09/28/09	ND	0.5	
PTD-CWD-DC02-0139	Wood	Horizontal surface of wooden bench below north window, eastern room; hexane wipe	09/28/09	ND	0.5	
PTE-CWD-CR01-0156	Wood	Horizontal wooden surface adjacent to window caulking and metal frame; hexane wipe	09/28/09	ND	0.5	

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Sample ID	Media	Sample Description	Sample Date	Total PCBs	Reporting Limit	Qualifier
Daycare / Play Area Interior Adjacent Surface Wipes continued (Results in ug/100cm^2)						
PTF-CWM-DC03-0099	Metal	Horizontal metal window frame, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWM-DC03-0102	Metal	Horizontal metal window frame, south wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWM-DC03-0116	Metal	Horizontal metal window frame, west wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWM-DC03-0119	Metal	Horizontal metal window frame just above floor in western room; hexane wipe	09/28/09	ND	0.5	
PTD-CWM-DC01-0129	Metal	Horizontal metal window frame, north wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWM-DC02-0136	Metal	Horizontal metal window fame, south wall of western room; hexane wipe	09/28/09	ND	0.5	
PTD-CWM-DC02-0138	Metal	Horizontal metal window frame, south wall of central room; hexane wipe	09/28/09	ND	0.5	
PTD-CWM-DC02-0140	Metal	Horizontal metal window frame, north wall of eastern room; hexane wipe	09/28/09	ND	0.5	
PTE-CWM-CR01-0147	Metal	Horizontal surface of radiator at western wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWM-CR01-0154	Metal	Horizontal metal window frame, east wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWM-PR01-0159	Metal	Horizontal metal window frame, south wall; hexane wipe	09/28/09	ND	0.5	
PTD-CWM-PR01-0164	Metal	Horizontal metal window frame, north wall; hexane wipe	09/28/09	ND	0.5	
PTF-CWT-DC03-0098	Tile	South of main entrance door; hexane wipe	09/28/09	ND	0.5	
PTF-CWT-DC03-0100	Tile	Floor near southern windows; hexane wipe	09/28/09	ND	0.5	
PTF-CWT-DC03-0107	Tile	Floor near southern windows; hexane wipe	09/28/09	ND	0.5	
PTF-CWT-DC03-0111	Tile	Floor near northern wall of Toddler 1 South; hexane wipe	09/28/09	ND	0.5	
PTD-CWT-DC01-0125	Tile	Central floor area near kitchen; hexane wipe	09/28/09	ND	0.5	
PTD-CWT-DC01-0131	Tile	Floor near northern wall in eastern room; hexane wipe	09/28/09	ND	0.5	
PTD-CWT-DC02-0143	Tile	Floor near northern wall in eastern room; hexane wipe	09/28/09	ND	0.5	
PTE-CWT-CR01-0148	Tile	Floor near western wall; hexane wipe	09/28/09	ND	0.5	
PTE-CWT-CR01-0149	Tile	Floor near northeast corner; hexane wipe	09/28/09	ND	0.5	
PTE-CWT-CR01-0150	Tile	Floor near southeast corner; hexane wipe	09/28/09	ND	0.5	
PTD-CWT-PR01-0162	Tile	Floor near southwest corner; hexane wipe	09/28/09	ND	0.5	
PTD-CWT-PR01-0167	Tile	Floor near northern wall; hexane wipe	09/28/09	3.1	0.5	
PTD-CWW-PR01-0160	Wall	Sheetrock column adjacent to windows, south wall; hexane wipe	09/28/09	ND	0.5	

Notes:
1. All samples were extracted by USEPA Method 3540C (Soxhlet) and analyzed by USEPA Method 8082.
2. All sample results are presented in the units indicated above.
3. All wipe samples were collected as concrete surface wipes from a 100 cm^2 area using wipes provided by the laboratory.
4. ND = Not detected above laboratory's minimum reporting limit, as indicated.
5. J = Value is estimated based on data validation.

Attachment: Surface Wipe, Soil, and Indoor Air Action Levels

Action levels have been derived for interior surfaces, exterior surfaces, soils, and indoor air to determine if interim response actions and/or additional actions are warranted at the Site prior to implementing the full-scale remedial action.

Action levels for interior and exterior surfaces (such as a windowsill, concrete, tile flooring or caulking), soil, and indoor air were determined either from published regulatory levels promulgated by the USEPA under 40 CFR 761 and/or MassDEP under the Massachusetts Contingency Plan (MCP – 310 CMR 40.0000) or were derived by Woodard & Curran using a health risk-based approach, following USEPA risk assessment guidelines. Specifically, and as described below, action levels for soils and non-porous surfaces reflect available regulatory levels from USEPA and/or MassDEP while risk-based levels were calculated for interior and exterior porous surfaces such as caulking, concrete, rubber mats and/or sealants, as well as for indoor air.

Two types of action levels were developed: "lower" action levels, which are levels at or below which no further action will be taken, and "immediate" action levels, which are levels above which an accelerated response action will be taken, such as cleaning, placement of barriers to eliminate exposure, removal of material or soil, etc. Levels found between the lower and immediate action levels will require either additional evaluation or monitoring, or in some instances, an interim measure may be implemented, such as covering a material with a temporary protective cover or prohibiting access to areas. Below, the underlying basis and/or assumptions of each action level, are summarized. Supporting calculations and references for the four risk-based action levels are provided on the attached tables.

Surface Soil

Surface soil (or sand) samples with concentrations below the lower action level indicate that no further actions will be taken; although, on a case by case basis, a potential response action may be undertaken. In contrast, accelerated response actions are required under the MCP for accessible soils in areas where children may be present with concentrations above the immediate action level. These two levels are as follows:

<u>Lower Action Level for Surface Soil</u>, High Contact Areas: **1 milligram per kilogram (mg/kg)**

- 40 CFR 761.61 – Default "Self Implementing" cleanup level for bulk PCB remediation wastes in high occupancy areas. These are areas where routine, daily exposure may occur such as residential settings, play areas, etc.

<u>Immediate Action Level for Surface Soil</u>, High Contact Areas: **10 mg/kg**

- 310 CMR 40.0321 (2)(b) – MCP concentration for accessible surface soils that may pose an "Imminent Hazard," requiring 2 hour reporting to MassDEP and accelerated response actions to either evaluate further and/or mitigate exposure.

Soils with concentrations between 1 and 10 mg/kg will require further evaluation. Interim actions to prevent exposures (such as placement of cover over soils or barrier installation) may be implemented on a case by case basis. Soils with concentrations greater than 2 ppm will require notification to MassDEP within 120 days and subsequent response actions.

Interior Surfaces

Wipe samples from interior surfaces with concentrations below the lower action level indicate that no further actions will be taken; although, on a case by case basis, a potential response action may be undertaken.

<u>Lower Action Level for Interior Non-Porous Surfaces</u>: **10 micrograms per 100 cm^2 (ug/100 cm^2)**

- 40 CFR 761.61, cleanup level for nonporous surfaces in high occupancy areas.

Immediate Action Level for Interior Non-Porous Surfaces: **16 ug/100 cm^2**

- Risk-based cleanup level consistent with porous surfaces (see below).
- Evaluates a child ages 1-2 years (shorter term exposure)
- One year exposure duration
- 350 days per year
- 8 contacts per day with palms and fingers
- Hand-to-mouth contact
- Assumes no hand washing occurs

Lower Action Level for Interior Porous Surfaces: **3.3 ug/100 cm^2**

- Evaluates a child ages 1-6 years
- Five year exposure duration (average upper bound residence time in Peabody Terrace).
- 350 days per year
- 8 contacts per day with palms and fingers
- Hand-to-mouth contact
- Assumes no hand washing occurs

Immediate Action Level for Interior Porous Surfaces: **16 ug/100 cm^2**

- Evaluates a child ages 1-2 years
- One year exposure duration
- 350 days per year
- 8 contacts per day with palms and fingers
- Hand-to-mouth contact
- Assumes no hand washing occurs

Initially, if levels exceed the action levels, then the sample locations will be cleaned following general commercial cleaning practices (e.g., simple green, etc.) to determine if the data represents PCB impacted dust/particulate matter. If subsequent re-sampling indicates that concentrations remain above the lower action levels, then further evaluation will be conducted. If subsequent re-sampling indicates that concentrations remain above the immediate action levels, then temporary measures, such as application of a temporary barrier, may be applied to prevent access to the material until such material can be removed and/or further assessment is performed.

Exterior Porous Surfaces

Wipe samples with concentrations below the lower action level indicate that no further actions will be taken; however, potential response actions may be undertaken on a case by case basis.

Lower Action Level for Exterior Surfaces: **8 ug/100 cm^2**

- Evaluates a child ages 1-6 years
- Five year exposure duration
- 150 days outside per year (non-winter months)
- 8 contacts per day with palms and fingers
- Hand-to-mouth contact
- Assumes no hand washing occurs

Immediate Action Level for Exterior Surfaces: **38 ug/100 cm^2**

- Evaluates a child ages 1-2 years
- One year exposure duration
- 150 days outside per year (non-winter months)
- 8 contacts per day with palms and fingers
- Hand-to-mouth contact
- Assumes no hand washing occurs

If concentrations are above the action levels, then the area will require further evaluation and/or response measures, including removal and replacement of materials (such as mats) and/or limiting access to materials through installation of barriers or cover material (placement of mulch, covering with rubber mats etc.).

Indoor Air

The approach to calculating indoor air action levels is based on the USEPA Risk Assessment Guidance for Superfund (RAGS)[2]. This guidance recommends using reference concentrations (RfCs) for evaluating non-carcinogenic effects and inhalation unit risk (IUR) values for carcinogenic effects. Specifically, this guidance states, "…when estimating risk via inhalation, risk assessors should use the concentration of the chemical in air as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on IR [inhalation rate] and BW [body weight] (e.g., mg/kg-day)."

The toxicological factor is based on inhalation exposures with measurable endpoints and is appropriate for use in evaluating indoor air. The IUR $(\mu g/m^3)^{-1}$ is the "the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 $\mu g/m^3$ in air" (USEPA, 2009)[3]. The toxicity value used in these calculations was obtained from USEPA Integrated Risk Information System (IRIS). IRIS does not list a non-carcinogenic reference concentration (RfC) for exposure to PCBs, it only lists an IUR (0.0001 $m^3/\mu g$); thus, action levels are calculated only for a carcinogenic end point.

Action levels were calculated using conservative exposure assumptions. Residents were assumed to be exposed for three different durations: 1 year (as an immediate action level), 3 years for typical residence (as an intermediate action level), and 5 years for upper bound residence (as a no further action level). It was further assumed that exposure during this period of time was continuous, i.e., 24 hours/day for 7 days/week. In addition, the action levels were calculated for an Incremental Lifetime Carcinogenic Risk (ILCR) of 1×10^{-6}, the lower bound of USEPA's acceptable risk range. Thus, the action levels are considered protective of tenants within the units.

Air action level: 1 year of exposure: **700 ng/m^3**

Air action level: 3 years of exposure: **233 ng/m^3**

Air action level: 5 years of exposure: **140 ng/m^3**

[2] Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). USEPA, 2009.
[3] Supplemental Guidance for Inhalation Risk Assessment, OSWER No. 9285.7-82, USEPA, January 2009.

Summary

In summary, the project-specific action levels are as follows:

No Further Action		Interim Action		Immediate Action	
Surface soils in high contact areas	< 1	Surface soils in high contact areas	> 1, < 10	Surface soils in high contact areas	> 10
Interior non-porous surface wipes in residential units	< 10	Interior non-porous surface wipes in residential units	> 10, < 16	Interior non-porous surface wipes in residential units	> 16
Interior porous surface wipes in residential units	< 3.3	Interior porous surface wipes in residential units	> 3.3, < 16	Interior porous surface wipes in residential units	> 16
Exterior wipes from porous surfaces in high contact areas	< 8	Exterior wipes from porous surfaces in high contact areas	> 8, < 38	Exterior wipes from porous surfaces in high contact areas	> 38
Indoor air (5 yr exposure)	140	Indoor air (3 yr exposure)	233	Indoor air (1 yr exposure)	700

Note: Values listed above are presented in mg/kg for surface soils, in $ug/100cm^2$ for surface wipes, and in ng/m^3 for indoor air.

Calculation of Risk-Based Action Level for PCBs
1-2 Year Old, 350 Day Interior Exposure
Peabody Terrace
Cambridge, Massachusetts

CHILD HANDS ONLY - Risks for contact with interior window caulking

Amount deposited on skin:
Ds= C *SA *CF* FTSS * EF * ED

Dermal Dose:
Dd = (Ds * (1- FTSM) * ABSd) / (BW * AT)

Oral Dose
Do = (Ds * FTSM * ABSo) / (BW * AT)

C	Wipe concentration (mg/cm^2)
SA	Skin surface area for hands (cm^2)
CF	Contact frequency (8/day)
FTSS	Fraction transferred surface-skin (unitless)
FTSM	Fraction transferred hand to mouth - based on USEPA (unitless)
ABSo	Oral absorption fraction (unitless)
ABSd	Dermal absorption fracton (unitless)
EF	Exposure frequency (days/yr)
ED	Exposure duration (yr)
BW	Body weight (kg)
ATnc	Averaging time - noncancer (days)
ATca	Averaging time - cancer (days)
RfD	Reference dose - chronic (mg/kg-day)
CSF	Cancer slope factor (mg/kg-day)$^{-1}$

Parameter	Child (1<2 years)
C (assumed EPC)	0.001
SA (0.5 *278)	139
CF	8
FTSS	0.01
FTSM	0.1
ABSo	1
ABSd	0.14
EF	350
ED	1
BW	11.2
ATnc	365
ATca	25550
RfD	2.00E-05
CSF	2

Weighted Dermal Dose calculations
Assumes 8 contacts/day
Distributed as: 8 @ sill (caulking)

NO WASHING CALCULATIONS

	Child (1<2 years)
	8 contacts
Sill - 8 Contacts	3.8920

Calculations		**Child (1<2 years)**
Exposure		
	Ds- total	3.8920
Dermal dose	Dd nc	1.20E-04
	Dd ca	1.72E-06
Oral dose	Do nc	9.56E-05
	Do ca	1.37E-06
Risk		
HI dermal		6.02E+00
HI oral		4.78E+00
HI TOTAL		1.08E+01
ELCR-dermal		3.44E-06
ELCR- oral		2.73E-06
ELCR TOTAL		6.18E-06

Total Ds for all contact surfaces 3.8920 mg

Calculation of Action Levels:

Equation:

$$\frac{\text{Assumed EPC (mg/cm}^2\text{)}}{\text{Associated ELCR (unitless)}} = \frac{X}{\text{Target risk level (unitless)}}$$

Input parameters:

$$\frac{0.001}{6.18\text{E-06}} = \frac{X}{1.00\text{E-06}}$$

Result: = 1.62E-04 mg/cm^2
= 16.2 ug/100cm^2

Calculation of Risk-Based Action Level for PCBs
1-6 Year Old, 350 Day Interior Exposure
Peabody Terrace
Cambridge, Massachusetts

CHILD HANDS ONLY Risks for contact with interior window caulking

Amount deposited on skin:
Ds= C *SA *CF* FTSS * EF * ED

Dermal Dose:
Dd = (Ds * (1- FTSM) * ABSd) / (BW * AT)

Oral Dose
Do = (Ds * FTSM * ABSo) / (BW * AT)

C	Wipe concentration (mg/cm^2)
SA	Skin surface area for hands (cm^2)
CF	Contact frequency (8/day)
FTSS	Fraction transferred surface-skin (unitless)
FTSM	Fraction transferred hand to mouth - based on USEPA (unitless)
ABSo	Oral absorption fraction (unitless)
ABSd	Dermal absorption fracton (unitless)
EF	Exposure frequency (days/yr)
ED	Exposure duration (yr)
BW	Body weight (kg)
ATnc	Averaging time - noncancer (days)
ATca	Averaging time - cancer (days)
RfD	Reference dose - chronic (mg/kg-day)
CSF	Cancer slope factor $(mg/kg\text{-}day)^{-1}$

Parameter	Child (1<6 years)
C (assumed EPC)	0.001
SA (0.5 *370)	185
CF	8
FTSS	0.01
FTSM	0.1
ABSo	1
ABSd	0.14
EF	350
ED	5
BW	15.0
ATnc	1825
ATca	25550
RfD	2.00E-05
CSF	2

Weighted Dermal Dose calculations
Assumes 8 contacts/day
Distributed as: 8 @ sill (caulking)

NO WASHING CALCULATIONS

	Child (1<6 years)
	8 contacts
Sill - 8 Contacts	25.9000

Calculations		Child (1<6 years)
Exposure		
	Ds- total	25.9
Dermal dose	Dd nc	1.19E-04
	Dd ca	8.51E-06
Oral dose	Do nc	9.45E-05
	Do ca	6.75349E-06
Risk		
HI dermal		5.96E+00
HI oral		4.73E+00
HI TOTAL		1.07E+01
ELCR-dermal		1.70E-05
ELCR- oral		1.35E-05
ELCR TOTAL		3.05E-05

Total Ds for all contact surfaces 25.9000 mg

Calculation of Action Levels:

Equation:

$$\frac{\text{Assumed EPC } (mg/cm^2)}{\text{Associated ELCR (unitless)}} = \frac{X}{\text{Target risk level (unitless)}}$$

Input parameters:

$$\frac{0.001}{3.05E\text{-}05} = \frac{X}{1.00E\text{-}06}$$

Result: = 3.28E-05 mg/cm^2
= 3.3 $ug/100cm^2$

Calculation of Risk-Based Action Level for PCBs
1-2 Year Old, 150 Day Exterior Exposure
Peabody Terrace
Cambridge, Massachusetts

CHILD HANDS ONLY Risks for contact with exterior window caulking

Amount deposited on skin:
Ds= C *SA *CF* FTSS * EF * ED

Dermal Dose:
Dd = (Ds * (1- FTSM) * ABSd) / (BW * AT)

Oral Dose
Do = (Ds * FTSM * ABSo) / (BW * AT)

C	Wipe concentration (mg/cm^2)
SA	Skin surface area for hands (cm^2)
CF	Contact frequency (8/day)
FTSS	Fraction transferred surface-skin (unitless)
FTSM	Fraction transferred hand to mouth - based on USEPA (unitless)
ABSo	Oral absorption fraction (unitless)
ABSd	Dermal absorption fracton (unitless)
EF	Exposure frequency (days/yr)
ED	Exposure duration (yr)
BW	Body weight (kg)
ATnc	Averaging time - noncancer (days)
ATca	Averaging time - cancer (days)
RfD	Reference dose - chronic (mg/kg-day)
CSF	Cancer slope factor $(mg/kg\text{-}day)^{-1}$

Parameter	Child (1<2 years)
C (assumed EPC)	0.001
SA (0.5 *278)	139
CF	8
FTSS	0.01
FTSM	0.1
ABSo	1
ABSd	0.14
EF	150
ED	1
BW	11.2
ATnc	365
ATca	25550
RfD	2.00E-05
CSF	2

Weighted Dermal Dose calculations
Assumes 8 contacts/day
Distributed as: 8 @ sill (caulking)

NO WASHING CALCULATIONS

	Child (1<2 years)
	8 contacts
Sill - 8 Contacts	1.6680

Calculations		**Child (1<2 years)**
Exposure		
	Ds- total	1.6680
Dermal dose	Dd nc	5.16E-05
	Dd ca	7.38E-07
Oral dose	Do nc	4.10E-05
	Do ca	5.86E-07
Risk		
HI dermal		2.58E+00
HI oral		2.05E+00
HI TOTAL		4.63E+00
ELCR-dermal		1.48E-06
ELCR- oral		1.17E-06
ELCR TOTAL		2.65E-06

Total Ds for all contact surfaces 1.6680 mg

Calculation of Action Levels:

Equation:

$$\frac{\text{Assumed EPC } (mg/cm^2)}{\text{Associated ELCR (unitless)}} = \frac{X}{\text{Target risk level (unitless)}}$$

Input parameters:

$$\frac{0.001}{2.65E\text{-}06} = \frac{X}{1.00E\text{-}06}$$

Result: = 3.78E-04 mg/cm^2
= 37.8 $ug/100cm^2$

Calculation of Risk-Based Action Level for PCBs
1-6 Year Old, 150 Day Exterior Exposure
Peabody Terrace
Cambridge, Massachusetts

CHILD HANDS ONLY Risks for contact with exterior window caulking

Amount deposited on skin:
Ds= C *SA *CF* FTSS * EF * ED

Dermal Dose:
Dd = (Ds * (1- FTSM) * ABSd) / (BW * AT)

Oral Dose
Do = (Ds * FTSM * ABSo) / (BW * AT)

C	Wipe concentration (mg/cm^2)
SA	Skin surface area for hands (cm^2)
CF	Contact frequency (8/day)
FTSS	Fraction transferred surface-skin (unitless)
FTSM	Fraction transferred hand to mouth - based on USEPA (unitless)
ABSo	Oral absorption fraction (unitless)
ABSd	Dermal absorption fracton (unitless)
EF	Exposure frequency (days/yr)
ED	Exposure duration (yr)
BW	Body weight (kg)
ATnc	Averaging time - noncancer (days)
ATca	Averaging time - cancer (days)
RfD	Reference dose - chronic (mg/kg-day)
CSF	Cancer slope factor (mg/kg-day)$^{-1}$

Parameter	Child (1<6 years)
C (assumed EPC)	0.001
SA (0.5 *370)	185
CF	8
FTSS	0.01
FTSM	0.1
ABSo	1
ABSd	0.14
EF	150
ED	5
BW	15.0
ATnc	1825
ATca	25550
RfD	2.00E-05
CSF	2

Weighted Dermal Dose calculations
Assumes 8 contacts/day
Distributed as: 8 @ sill (caulking)

NO WASHING CALCULATIONS

	Child (1<6 years)
	8 contacts
Sill - 8 Contacts	11.1000

Calculations		**Child (1<6 years)**
Exposure		
	Ds- total	11.10
Dermal dose	Dd nc	5.11E-05
	Dd ca	3.65E-06
Oral dose	Do nc	4.05E-05
	Do ca	2.89E-06
Risk		
HI dermal		2.55E+00
HI oral		2.03E+00
HI TOTAL		4.58E+00
ELCR-dermal		7.29E-06
ELCR- oral		5.79E-06
ELCR TOTAL		1.31E-05

Total Ds for all contact surfaces 11.1000 mg

Calculation of Action Levels:

Equation:

$$\frac{\text{Assumed EPC (mg/cm}^2\text{)}}{\text{Associated ELCR (unitless)}} = \frac{X}{\text{Target risk level (unitless)}}$$

Input parameters:

$$\frac{0.001}{1.31\text{E-}05} = \frac{X}{1.00\text{E-}06}$$

Result:	=	7.64E-05	mg/cm^2
	=	7.6	ug/100cm^2

Calculation of Risk-Based Action Level for PCBs
365 Day Exposure to Indoor Air
Peabody Terrace
Cambridge, Massachusetts

Risks for Inhalation of Indoor Air - Residential Units
Carcinogenic Risk

Equations

ILCR = Exposure factor * Air concentration * IUR

Air concentration = ILCR / (Exposure factor * IUR)

Definitions

ILCR	Incremental Lifetime Carcinogenic Risk
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
AP	Averaging Period for carcinogens
Exposure factor	Exposure duration as a fraction of AP
Air concentration	Calculated action level for air sample results

Parameters

ILCR	10E-6	
IRIS UR	1E-4	m3/µg
AP	70	years

Exposure Factors

1 year / AP	0.014
3 years / AP	0.043
5 years / AP	0.071

Calculations

		ug/m^3	ng/m^3
Air concentration	1 yr	0.70	**700**
Air concentration	3 yrs	0.23	**233**
Air concentration	5 yrs	0.14	**140**

APPENDIX B: WRITTEN CERTIFICATION

WOODARD &CURRAN

Certification

The undersigned owner of the property where the cleanup site is located and the party conducting the cleanup certify that all sampling plans, sampling collection procedures, sample preparation procedures, extraction procedures and instrumental/chemical analysis procedures used to assess or characterize the PCB contamination at the cleanup site are on file at the location indicated below and are available for EPA inspection, as set forth below.

Document Location

Harvard University
Department of Environmental Health & Safety
46 Blackstone Street
Cambridge, MA 02139

Property Owner and Party Conducting the Cleanup

Steven C. Nason

Authorized Signature

2.17.10

Date

STEVEN C. NASON

Name of Authorized representative (print)

DIRECTOR, RESIDENTIAL REAL ESTATE

Title HARVARD REAL ESTATE SERVICES

APPENDIX C: SAMPLE IDENTIFICATION PLAN

Sample Identification Program

A four part naming convention will be used to identify all site samples.

(1) Site and Building

The first part of each sample ID will reference the site (Peabody Terrace) and the apartment building letter.

- First two characters are always "PT"
- Third character will be one of the following: A, B, C, D, E, F, X, Y, Z

For example, "PTA" refers to Peabody Terrace Building A, and "PTY" refers to Peabody Terrace Building Y.

(2) Sample Purpose, Type, and Media

The second part of each sample ID will provide three pieces of information:

- Sample purpose (characterization [pre-remediation] or verification [post-remediation]) – letter options are:
    - C: Characterization
    - V: Verification
- Sample type (bulk, wipe, or air) – letter options are:
    - B: Bulk
    - W: Wipe
    - A: Air
- Sample media – letter options are:
    - A: Asphalt
    - B: Brick
    - C: Concrete
    - D: Wood
    - E: Epoxy
    - K: Caulking
    - M: Metal
    - N: Sand
    - P: Play surface (non-soil, non-asphalt, non-concrete, etc)
    - R: Air
    - S: Soil
    - T: Tile
    - W: Interior Wall

For example, "CWE" refers to a characterization wipe of epoxy, and "VBS" refers to a verification bulk soil sample.

(3) Sample Location

The third part of the sample ID will further identify the sample location, which will be different for building materials than it will be for samples collected from outdoor ground surfaces:

- Samples collected from interior or exterior building materials, regardless of the sample type or media, will be identified by a four-digit number: the first pair of digits indicates the building number (e.g. 01, 14, 22, 31, etc.), and the second pair of digits indicates the unit number (e.g. 12, 24, 33, etc.)
- Samples collected from designated play areas will be identified by the area: PA01, PA02, PA03, PA04, PA05, or PA06
- Samples collected from non-play area ground surfaces will be given only a single-letter directional identifier: N (north), S (south), E (east), or W (west).

For example:

PTD-CWC-PA01… is a characterization wipe sample from concrete in Play Area 1 (adjacent to building D).

PTX-VBB-1121… refers to a verification bulk brick sample from Building X, Apartment 11, Unit 21.

PTE-CBS-W… refers to a characterization bulk soil sample from the west side of Building E.

(4) Unique Sample ID

The fourth and final part of the sample ID will include a unique four digit sample ID number, beginning with 0001. These numbers will be used sequentially regardless of the sample location, media, building, etc. For example, if the three examples provided in Part 3 above were the first, second, and third samples collected at the site, they would be identified as follows:

PTD-CWC-PA01-0001

PTX-VBB-1121-0002

PTE-CBS-W-0003

* QA/QC Samples

The only exception to this naming convention will be the addition of one character to the second part of the sample ID to indicate QAQC Samples (either field blanks (Q) or duplicate samples (D)). For example, a field blank collected on a sample day where bulk concrete characterization samples were taken could be identified as PTA-CBCQ-1821-0123. A duplicate verification soil sample could be identified as PTF-VBSD-E-0124.

APPENDIX D: LABORATORY ANALYTICAL REPORTS & DATA VALIDATION SUMMARIES (CD)

APPENDIX E: PERIMETER AIR MONITORING PLAN AND LOG SHEET

Airborne particulate matter (PM) consists of many different substances suspended in air in the form of particles (solids or liquid droplets) that vary widely in size. Inhalation hazards are caused if the intake of these particles includes intake of vapors and/or contaminated dust. Particles less than 10 micrometers in diameter (PM-10), which include both respirable fine (less than 2.5 micrometers) and coarse (less than 10 micrometers) dust particles, pose the greatest potential health concern because they can pass through the nose and throat and get into the lungs.

During the performance of the planned remediation activities, particulate matter in the form of potentially PCB-affected dust may be generated. The greatest potential for the generation of affected dust is during the removal and surface preparation for caulking, excavation of soils, and during placement of soils into containers for off-site disposal.

As indicated in the remediation plan, the main dust control mechanism to be employed on the project will be the use of engineering controls (e.g. wetting the soils, using hand tools as opposed to grinding away caulking) and personal protective equipment (PPE). In addition, particulate air monitoring will be conducted during potential dust-generating activities in the Support Work Zone (SWZ) and perimeter to the SWZ. The SWZ is the area just outside of the active work areas, in designated safe work zones or support zones. Particulate air monitoring will determine if fugitive dust particles are present in the ambient air within the designated SWZ and/or perimeter during active removal activities. A direct-reading particulate meter will be used to monitor airborne particulate concentrations during site activities. Particulate concentrations shall be utilized as an indirect indicator of exposures to on-site receptors.

Dust concentrations in the SWZ will be measured using a suitable real time aerosol particulate monitor capable of determining ambient air fugitive dust concentrations to 0.001 milligrams per cubic meter (mg/m^3). Air monitoring shall be conducted while active removal activities are occurring and at a frequency of one reading per hour of activities. Air monitoring equipment will be operated by the Site safety officer or by a competent representative under the direction of the Site safety officer. Prior to the active removal actions and at periodic points during the project, air monitoring readings will be recorded to document background particulate matter concentrations. All readings will be recorded on the air monitoring log sheet; example attached.

If visible dust is observed or if total particulate concentrations in the SWZ exceed the action limits (as specified below and incorporating background readings) and are sustained (i.e. greater than 5 minutes), then a temporary work stoppage to employ additional dust suppression techniques to mitigate fugitive dust shall be initiated. If applicable, the dust suppression techniques shall involve the application of a fine mist of water over the area creating the fugitive dust condition. The water shall be applied either by small hand held sprayers, sprinklers, or hose nozzles. The water source for dust suppression activities will be from the building's water supply. In the event that the total of airborne particulate cannot be maintained below the action limit in the SWZ, then work activities shall be ceased until sustained readings are below the action limit or the SWZ designation is re-evaluated.

OSHA has published the following permissible exposure limits (8 hour time weighted average) for air contaminants (29 CFR 1910.1000):

Air Contaminant	PEL (8-hour TWA)
Total Dust	15 mg/m^3
Respirable Dust Fraction	5 mg/m^3
PCBs (42% Chlorine)	1 mg/m^3
PCBs (54% Chlorine)	0.5 mg/m^3

In addition, EPA has established a National Ambient Air Quality Standard for PM-10 of 0.150 mg/m^3 (24-hr average).

A total airborne particulate action limit has been established for the remediation work to be conducted at Peabody Terrace with consideration of the specific receptors, PCB concentrations, work activities, and OSHA permissible exposure limits. The action limit applies only to air monitoring within the SWZ and perimeter to the SWZ; an action limit has not been set for the active work zones (exclusion zones) as engineering controls will be used within these zones.

Given the high-occupancy setting of the project and the anticipated PCB concentration in dust that may be generated during abatement activities, a conservative action limit of 0.1 mg/m^3 above background will be maintained during site work. Air monitoring at a location representative of background air conditions (i.e. a location upwind of the work area) will be conducted at the same frequency as SWZ monitoring to obtain data representative of real-time background conditions. The action limit will be used to determine if and when additional engineered controls and/or work stoppages would be necessary.

Air monitoring equipment will be calibrated according to manufacturer's specifications. Weather and other site conditions will affect the normal operation of the equipment, which will require routine maintenance. Weather conditions will be noted on daily air monitoring logs. It is expected that dust or other particulate matter will not be a concern on rainy or misty days.

AIR MONITORING LOG SHEET
PEABODY TERRACE REMEDIATION PROJECT

Monitoring Location: ___________________________________

Date	Time	Dust Level mg/M^3	Temperature ^oF	Weather Conditions	Current Site Activity	NOTES

APPENDIX F: PRODUCT TECHNICAL SPECIFICATIONS

Product Data Sheet
Edition 7.2003
Identification no. 601
Sikagard 62

Construction

Sikagard® 62

High-build, protective, solvent-free, colored epoxy coating

Description	Sikagard 62 is a 2-component, 100% solids, moisture-tolerant epoxy resin. It produces a high-build, protective, dampproofing and waterproofing vapor-barrier system.
Where to Use	Use as a high build, corrosion-resistant, protective coating, as a protective lining for secondary containment structures or as a seamless flooring system.
Advantages	■ Exceptional tensile strength. ■ Good chemical resistance for long-term protection. ■ Convenient A:B = 1:1 mixing ratio. ■ Easy, paint-like viscosity. ■ Available in 3 standard colors: gray, red, and tan. Special color matches available upon request. ■ Excellent bonding to all common structural substrates. ■ Super abrasion resistance for long-term wear. ■ Sikagard 62 gray, after cure, is approved for contact with potable water. ■ Material is USDA certifiable.
Coverage	Approximately 150-250 sq. ft./gal. depending on condition of substrate.
Packaging	4 gal. units; 1 qt. units, 12/case.

How to Use

Surface Preparation	Surface must be clean and sound. It may be dry or damp, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes and any other contaminants. **Preparation Work: Concrete** - Should be cleaned and prepared to achieve a laitance and contaminant free, open textured surface by blastcleaning or equivalent mechanical means. **Steel -** Should be cleaned and prepared thoroughly by blastcleaning.
Mixing	**Pre-mix each component.** Proportion equal parts by volume of Components 'A' and 'B' into a clean mixing container. Mix with a low-speed (400-600 rpm) drill using a Sika paddle for 3 minutes, until uniform in color.
Application	Apply coating using high-quality roller, brush or spray. Two coats are recommended. Apply second coat as soon as the first coat is tack-free and the traffic of application will not damage the first coat. The

Typical Data *(Material and curing conditions @ 73°F (23°C) and 50% R.H.)*

Shelf Life	2 years in original, unopened containers.
Storage Conditions	Store dry at 40°-95°F (4°-35°C). **Condition material to 65°-75°F (18°-24°C) before using.**
Color	Gray, red, tan.
Mixing Ratio	Component 'A' : Component 'B'=1:1 by volume.
Viscosity (Mixed)	Approximately 3,500 cps.
Pot Life	Approximately 35 to 40 minutes. (60 gram mass).
Tack-Free Time	Approximately 4 hours.
Open Time	Light foot traffic: 5-7 hours. Rubber-wheel traffic: 8-10 hours.
Immersion and Chemical Exposure	Minimum cure: 3 days

Tensile Properties (ASTM D-638)

14 day	Tensile Strength	5,400 psi (37.3 MPa)
	Elongation at Break	2.7 %

Abrasion (ASTM D-1044) (Taber Abrader)

7 day	Weight loss, 1,000 cycles (H-22 wheel, 1,000 gm weight)	0.61 gm

Abrasion Resistance (ASTM D-968)

14 day	Abrasion Coefficient	51 liters/mil.

Adhesion (ASTM D-3359)

1 day	Adhesion Classification	4A

Water Absorption (ASTM D-570)

7 day	(24 hour immersion)	0.1%

Construction

second coat, however, **must** be applied within 48 hours since a longer delay will require additional surface preparation.

Do not spray with slip resistant granules mixed into the coating. For use as a seamless flooring system, consult Technical Service.

Limitations

- Minimum substrate and ambient temperature for application 50°F (10°C).
- Do not apply over wet, glistening surface.
- Material is a vapor barrier after cure.
- Do not apply to porous surfaces exhibiting moisture-vapor transmission during the application. Consult Technical Service.
- Minimum age of concrete prior to application is 21-28 days, depending on curing and drying conditions.
- Do not apply to exterior, on-grade substrates.
- Use oven-dried aggregate only.
- Do not thin with solvents.
- Color may alter due to variations in lighting and/or UV exposure.
- On ‘green or ‘damp’ concrete, EpoCem can be used as a pore filler to reduce vapor drive and potential osmotic blistering.

Caution

Component ‘A’ - Irritant; Sensitizer - Contains epoxy resin. Can cause sensitization after prolonged or repeated contact. Skin and eye irritant. Vapors may cause respiratory irritation. Use only with adequate ventilation. Use of safety goggles and chemical resistant gloves is recommended. In case of high vapor concentrations, use an appropriate NIOSH approved respirator. Remove contaminated clothing.

Component ‘B’ - Sensitizer - Contains amines. Contact with eyes or skin may cause severe burns. Can cause sensitization after prolonged or repeated contact. Skin and eye irritant. Vapors may cause respiratory irritation. Use only with adequate ventilation. Use of safety goggles and chemical resistant gloves is recommended. In case of high vapor concentrations, use an appropriate NIOSH approved respirator. Remove contaminated clothing.

First Aid

Eyes: Hold eyelids apart and flush thoroughly with water for 15 minutes. **Skin:** Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. **Inhalation:** Remove person to fresh air. **Ingestion:** Do not induce vomiting.

In all cases, contact a physician immediately if symptoms persist.

Clean Up

Ventilate area. Confine spill. Collect with absorbent material. Dispose of in accordance with current, applicable local, state and federal regulations. Uncured material can be removed with approved solvent. Cured material can only be removed mechanically.

Chemical Resistance

Specimen: Two Coats - 10 mils Total
Cured 10 days
Substrate: asbestos cement

Chemical	Test Temp.	Storage Time and Evaluation				
		1 Day	1 Month	2 Months	6 Months	12 Months
Water	75°F (24°C) 100°F (38°C) 140°F (60°C)	A A A	A A A	A A A	A A A, D	A A A, D
Sodium Chloride Solution (Saturated)	75°F (24°F) 100°F (38°C)	A A	A A	A A	A A	A A
Sodium Hydroxide 30%	75°F (24°C)	A	A	A	A	A
Cement Water (Saturated)	75°F (24°C)	A	A	A	A	A
Detergent Solution (5% Ajax)	75°F (24°C) 140°F (60°C)	A A	A A	A A	A A, D	A A, D
Hydrochloric Acid 10%	75°F (24°C)	A	A	A	A	A
Sulfuric Acid 10%	75°F (24°C)	A	A	A	B	B
Oxalic Acid 10%	75°F (24°C)	A	A, D	A, D	A, D	A, D
Citric Acid 10%	75°F (24°C)	A	A, D	A, D	A, D	A, D
Fuel Oil (Home Heating)	75°F (24°C)	A	A	A	A	A, D
Gasoline (Unleaded)	75°F (24°C)	A	A	A	A	A, D
Iso-Octane	75°F (24°C)	A	A	A	A	A, D
Toluol	75°F (24°C)	A	A	A	A	A, D
Silage	75°F (24°C)	A	A	A, D	A, D	B, D
Synthetic Silage	75°F (24°C)	A	A	B, D	B, D	B, D
Ethyl Alcohol	75°F (24°C)	A	C	-	-	-

A: Resistant in permanent contact
B: Temporary resistance
C: Destroyed
D: Discolored

KEEP CONTAINER TIGHTLY CLOSED
NOT FOR INTERNAL CONSUMPTION
KEEP OUT OF REACH OF CHILDREN
FOR INDUSTRIAL USE ONLY
CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

Sika warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Technical Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer’s sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

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Fax: 52 42 25 0537

QUALITY ISO 9001 9002 ACHIEVEMENT

Quality Certification Numbers: Lyndhurst: FM 69711 (ISO 9000), FM 70421 (QS 9000), Marion: FM 69715, Kansas City: FM 69107, Santa Fe Springs: FM 69408

Product Data Sheet
Edition 3.12.2009
Identification no. 604
Sikagard 670W

Construction

Sikagard® 670W

Water dispersed, acrylic, protective, anti-carbonation coating

Description	Sikagard 670W is a water dispersed colored, acrylic, protective coating. Sikagard 670W prevents moisture ingress, is water vapor permeable and provides an excellent carbonation barrier.
Where to Use	Above grade, exterior application on buildings or civil engineering structures. It is designed to aesthetically enhance and protect concrete and other masonry substrates subject to normal hydrothermal movement. Protective, decorative seal coat for SikaColor and Sikadur Balcony Systems.
Advantages	■ Easy to apply. ■ Extremely resistant to dirt pick-up and mildew. ■ Excellent resistance to carbon dioxide and other aggressive gas diffusion. ■ Excellent UV resistance. ■ Excellent weathering resistance. ■ Prevents ingress of chlorides. ■ Cost effective protection. ■ Vapor permeable; allows each way water vapor diffusion (breathable).
Coverage	Theoretical per coat: 300 sq. ft./gal. Wet film thickness: 5 mils. Dry film thickness: 2.5 mils. Normal coating system is two coats minimum at a total nominal dry film thickness of 5 mils. Consumption is obviously dependent on substrate. In addition, allowance must be made for surface profile, variations in applied film thickness, loss and waste. A third coat may be necessary where opacity is reduced through thinning of the first coat, on dense substrates or with very bright color shades.
Packaging	5 gallon, re-closable plastic pails.

How to Use

Surface preparation

All surfaces to be coated must be clean, dry, laitance free, sound and frost-free with curing compound residues and any other contaminants removed. An open textured sandpaper-like surface is ideal (CSP-3). Where necessary, surfaces should be prepared mechanically by blast cleaning or high pressure waterjetting. Allow adequate time for drying. Bugholes, cracks or irregularities of substrate should be filled and leveled with SikaTop, Sika MonoTop leveling mortar or Sikagard Surface Fillers as appropriate.

Typical Data (Material and curing conditions at 73°F (23°C) and 50% R.H.)

Shelf Life 1 year in original, unopened container.

Storage Conditions Store dry at 40°-95°F (4°-35°C). **Condition material to 60°-75°F before using.** Protect from freezing. If frozen, discard.

Colors 463 standard colors. Custom color-matching available.

Pot Life Indefinite, provided proper care is taken in protecting the system from moisture, freezing, contamination, or evaporation.

Solids Content **by weight:** 60% **by volume:** 46%

Waiting and Drying Times

Between Coats:	Rain Resistant After	Final Drying
45°F (7°C) approx. 90 min.	approx. 5 hours	approx. 24 hours
68°F (20°C) approx. 30 min.	approx. 1 hour	approx. 4 hours
85°F (30°C) approx. 20 min.	approx. 40 min.	approx. 3 hours

Water Vapor Diffusion (at 5 mils. = 120 microns dry film thickness)
μ - value H_2O (diffusion coefficient) = 3,140
SdH_2O (equivalent air thickness) = 1.3 ft. (0.4 m)

Carbon Dioxide Diffusion (at 5 mils. = 120 microns dry film thickness)
μ- value CO_2 (diffusion coefficient) = 1,100,000
SdCO_2 (equivalent air thickness) = 433 ft. (132 m.)
Equivalent concrete thickness (Sc) = approximately 13 inches (33 cm.)

Moisture Vapor Permeability (ASTM E-96) 17.9 Perms

Flame Spread and Smoke Development (ASTM E-84-94)
Flame Spread: 0 Smoke Development: 5 Class Rating: A

Weathering (ASTM G-26) 2000 hours Excellent, no chalking or cracking.

Construction

Priming	All porous areas or concrete with excessive porosity should be primed using Sikagard 552W Primer or SikaLatex R to allow easy application of Sikagard 670W.
Mixing	Stir thoroughly to ensure uniformity using a low speed (400-600 rpm) drill and Sika paddle. To minimize color variation when using multiple batches, blend two batches of Sikagard 670W. Use one pail and maintain the second pail to repeat this procedure (boxing) for the entire application.
Application	Any areas of glass or other surfaces should be masked. Recommended application temperatures (ambient and substrate) 45°-95°F (5°-35°C). Sikagard 670W can be applied by brush, roller, or spray over entire area moving in one direction. Allow a minimum of 20-90 minutes prior to re-coating. At lower temperatures and high humidity, waiting time will be prolonged. At higher temperatures, work carefully to maintain a 'wet' edge. Sikagard 670W is usually applied using a short nap lambs wool roller. Sikagard 670W is particularly suitable for application by spray using the most standard spray painting equipment. As with all coatings, jobsite mock-ups should always be completed to confirm acceptability of workmanship and material. **Note:** To achieve a dry film thickness of 4-6 mils., two uniform coats should be anticipated. On porous substrates, a third coat may be necessary and on particularly dense substrates, the first coat should be thinned 10% by volume with water. A third coat may then be needed for opacity. **As a protective, decorative seal coat:** Apply with a short nap roller at a rate of 160 sq. ft./gal. (10 mils, wft) after the second coat of SikaColor has cured. On the Sikadur Balcony System, the 670W seal coat is applied with a short nap roller at a rate of 160 sq. ft. per gallon (10 mils., wft) after all excess broadcast sand has been removed from the cured, broadcasted Sikadur 22 Lo-Mod layer.
Limitations	■ Do not use over moving cracks. ■ Substrate must be dry prior to the application. ■ Minimum age of concrete prior to the application is 14 days, depending on curing and drying conditions (moisture content must be below 5%). ■ Minimum age of SikaTop or Sika MonoTop thin layer renderings is 3 days prior to the application of 670W (moisture content must be below 5%). ■ Sikagard 670W should not be applied at relative humidities greater than 90%, or if rain is forecast within the specified rain resistance period. ■ Allow sufficient time for the substrate to dry after rain or other inclement conditions. ■ Product must be protected from freezing. If frozen, discard. ■ Not designed for use as a vehicular traffic bearing surface. ■ During application, regular monitoring of wet film thickness and material consumption is advised to ensure that the correct layer thickness is achieved. ■ When overcoating existing coatings, compatibility and adhesion testing is recommended. ■ Do not store Sikagard 670W in direct sunlight for prolonged periods.

Caution

Warning	Avoid breathing vapors. Use only with adequate ventilation. May cause respiratory irritation and headaches.
Irritant	Skin, eye, and respiratory irritant; avoid contact. Use of safety goggles and chemical resistant gloves is recommended. Remove contaminated clothing.
First Aid	In case of eye contact, flush with water for 15 minutes, contact physician immediately. For skin contact, wash skin with soap water. For respiratory problems, remove person to fresh air. Wash clothing before re-use.
Spill Clean Up	Confine spill, ventilate closed areas, and collect with absorbent material. Dispose of in accordance with current, applicable, local, state, and federal regulations. Uncured material can be removed water. Cured material can only be removed mechanically.

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BSI
ISO 9000:2000

Product Data Sheet
Edition 7.1.2008
Identification no. 350
Sikadur 35, Hi-Mod LV

Sikadur® 35, Hi-Mod LV

High-modulus, low-viscosity, high-strength epoxy grouting/sealing/binder adhesive

Construction

Description

Sikadur 35, Hi-Mod LV is a 2-component, 100% solids, moisture-tolerant, low-viscosity, high-strength, multi-purpose, epoxy resin adhesive. It conforms to the current ASTM C-881 and AASHTO M-235 specifications.

Where to Use

- Pressure-injection of cracks in structural concrete, masonry, wood, etc.
- Gravity-feed of cracks in horizontal concrete and masonry.
- Epoxy resin binder for epoxy mortar patching and overlay of interior, horizontal surfaces.
- Seal interior slabs and exterior above-grade slabs from water, chlorides, and mild chemical attack; also improves wearability.

Advantages

- Super low viscosity.
- Convenient easy mix ratio A:B = 2:1 by volume.
- Unique, high-strength, structural adhesive for “can’t dry” surfaces.
- Deep penetrating and tenacious bonding of cracks in structural concrete.
- High-early-strength developing adhesive.
- Excellent chemical resistance for flooring systems.

Coverage

1 gal. yields 231 cu. in. of adhesive and grout. 1 gal. of adhesive, when mixed with 5 gal. by loose volume of oven-dried aggregate, yields approximately 808.5 cu. in. of epoxy mortar.

Packaging

3 gal. units; 1 gal. units, 2/case; 12 fl.-oz. units, 12/case.

Typical Data *(Material and curing conditions @ 73°F (23°C) and 50% R.H.)*

Shelf Life 2 years in original, unopened containers.

Storage Conditions Store dry at 40°-95°F (4°-35°C). **Condition material to 65°-75°F (18°-24°C) before using.**

Color Clear, amber.

Mixing Ratio Component A : Component B=2:1 by volume.

Viscosity (Mixed) Approximately 375 cps.

Pot Life Approximately 25 minutes. (60 gram mass)

Tack Free Time	**40°F (4°C)**	**73°F (23°C)**	**90°F (32°C)**
(3-5 mils) Neat	14-16 hrs.	3-3.5 hrs.	1.5-2 hrs.

Tensile Properties (ASTM D-638)

		Neat		**Mortar**
7 day	Tensile Strength	8,900 psi (61.4 MPa)	**14 day**	840 psi (5.8 MPa)
	Elongation at Break	5.4%		0.3%
14 day	Modulus of Elasticity	4.1 X 10^5 psi (2,800 MPa)		7.6 X 10^5 psi (5,200 MPa)

Flexural Properties (ASTM D-790)

14 day	Flexural Strength (Modulus of Rupture)	14,000 psi (96.6 MPa)	2,200 psi (15.2 MPa)
	Tangent Modulus of Elasticity in Bending	3.7 x 10^5 psi (2,600 MPa)	9.5 X 10^5 psi (6,500 MPa)

Shear Strength (ASTM D-732)

14 day Shear Strength 5,100 psi (35.2 MPa) 2,300 psi (15.9 MPa)

Heat Deflection Temperature (ASTM D-648)

7 day [fiber stress loading = 264 psi (1.8 MPa)] 124°F (51°C) 129°F (54°C)

Bond Strength (ASTM C-882): Hardened concrete to hardened concrete

2 day	**(moist cure)**	Bond Strength	4,000 psi (27.6 MPa)
14 day	**(moist cure)**	Bond Strength	2,900 psi (20.0 MPa)
2 day	**(dry cure)**	Bond Strength	2,800 psi (19.3 MPa)

Water Absorption (ASTM D-570) **7 day** (24 hour immersion)0.27 %

Compressive Properties (ASTM D-695)

Compressive Strength, psi (MPa)	**Neat**			**Mortar (1:5)**		
	40°F (4°C)	73°F (23°C)	90°F (32°C)	40°F(4°C)	73°F (23°C)	90°F (32°C)
4 hour	-	-	-	-	-	800 (5.5)
8 hour	-	180 (1.2)	3,200 (22.1)	-	-	4,100 (28.3)
16 hour	-	4,500 (31.1)	6,300 (43.5)	-	400 (2.8)	5,700 (39.3)
1 day	-	6,000 (41.4)	9,100 (62.8)	120 (0.8)	5,000 (34.5)	6,900 (47.6)
3 day	4,000 (27.6)	10,700 (73.8)	10,500 (72.5)	6,200 (42.8)	6,800 (46.9)	7,000 (48.3)
7 day	6,800 (46.9)	11,000 (75.9)	10,500 (72.5)	6,300 (43.5)	7,900 (54.5)	8,800 (60.7)
14 day	10,300 (71.1)	12,000 (82.8)	10,500 (72.5)	6,800 (46.9)	8,500 (58.7)	8,800 (60.7)
28 day	12,400 (85.6)	13,000 (89.7)	10,500 (72.5)	7,000 (48.3)	8,600 (59.3)	8,800 (60.7)

Compressive Modulus	**Neat**		**Mortar**
7 day	3.2 X 10^5 psi (2,200 MPa)	**28 day**	8.1 X 10^5 psi (5,600 MPa)

Construction

How to Use

Surface Preparation — Surface must be clean and sound. It may be dry or damp, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles and disintegrated materials.

Preparation Work: — **Concrete** - Blast clean, shot blast or use other approved mechanical means to provide an open roughened texture. **Steel** - Should be cleaned and prepared thoroughly by blast cleaning.

Mixing — Proportion 1 part Component 'B' to 2 parts Component 'A' by volume into a clean pail. Mix thoroughly for 3 minutes with Sika Paddle on low-speed (400- 600 rpm) drill until uniformly blended.
Mix only that quantity that can be used within its pot life.

To prepare an epoxy mortar, slowly add 4-5 parts by loose volume of an oven-dried aggregate to 1 part of the mixed Sikadur 35, Hi-Mod LV and mix until uniform in consistency.

Application — **To gravity feed cracks** - Blow vee-notched crack clean with oil-free compressed air. Pour neat Sikadur 35, Hi-Mod LV into vee-notched crack. Continue placement until completely filled. Seal underside of slab prior to filling if cracks reflect through.

To pressure-inject cracks - Use automated injection equipment or manual method. Set appropriate injection ports based on system used. Seal ports and crack with Sikadur 31, Hi-Mod Gel or Sikadur 33. When the epoxy adhesive seal has cured, inject Sikadur 35, Hi-Mod LV with steady pressure. Consult Technical Service for additional information.

To seal slabs - Spread neat Sikadur 35, Hi-Mod LV over slab. Allow penetration. Remove excess to prevent surface film. Seal interior slabs and above-grade exterior slabs only.

For an epoxy mortar - Prime prepared surface with neat Sikadur 35, Hi-Mod LV. Place prepared epoxy mortar before primer becomes tack-free. Place the epoxy mortar using trowels. Compact and level with vibrating screed or trowels. Finish with finishing trowel. Sikadur 35, Hi-Mod LV mortar is for interior use only.

Limitations

- Minimum substrate and ambient temperature 40°F (4°C).
- Do not thin with solvents. Consult Technical Service at 800-933-7452.
- Use oven-dried aggregate only.
- Maximum epoxy mortar thickness is 1.5 in. (38 mm) per lift.
- Epoxy mortar is for interior use only.
- Do not seal exterior slabs on grade.
- Minimum age of concrete must be 21-28 days, depending on curing and drying conditions, for mortar and to seal slabs.
- Porous substrates must be tested for moisture-vapor transmission prior to application.
- Not for injection of cracks under hydrostatic pressure at the time of application.
- Do not inject cracks greater than ¼ in. (6 mm) Consult Technical Service.
- Not an aesthetic product. Color may alter due to variations in lighting and/or UV exposure.

Warning

Component 'A' - IRRITANT; SENSITIZER - Contains epoxy resin, nonyl phenol. May cause skin sensitization after prolonged or repeated contact. Eye irritant. May cause skin/respiratory irritation. Harmful if swallowed.

Component 'B' - CORROSIVE; IRRITANT; SENSITIZER Contains amines, benzylalcohol, nonyl phenol. Contact with eyes or skin causes severe burns. May cause skin sensitization after prolonged or repeated contact. Eye irritant. May cause respiratory irritation. Harmful if swallowed. Deliberate concentration of vapors of Component A or B for purposes of inhalation is harmful and can be fatal.

First Aid — **Eyes:** Hold eyelids apart and flush thoroughly with water for 15 minutes. **Skin:** Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. **Inhalation:** Remove person to fresh air. **Ingestion:** Do not induce vomiting. **In all cases, contact a physician immediately if symptoms persist.**

Clean Up — Wear chemical resistant gloves/goggles/clothing. Ventilate area. In absence of adequate general and local exhaust ventilation, use a properly filled NIOSH respirator. Confine spill. Collect with absorbent material. Dispose of in accordance with current, applicable local, state and federal regulations. Uncured material can be removed with solvent. Strictly follow manufacturer's warnings and instructions for use. Cured material can only be removed mechanically.

Handling & Storage — Avoid direct contact with skin and eyes. Wear chemical resistant gloves/goggles/clothing. Use only with adequate ventilation. In absence of adequate general and local exhaust ventilation, use a properly filled NIOSH respirator. Wash thoroughly after handling product. Launder clothing before reuse. Store in a cool dry well ventilated area.

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ISO 9000:2000

Construction

Product Data Sheet
Edition 1.11.2008
Identification no. 464
Sikaflex-2c NS

Sikaflex®-2c NS

Two-component, non-sag, polyurethane elastomeric sealant

Description	Sikaflex-2c NS is a 2-component, premium-grade, polyurethane-based, elastomeric sealant. It is principally a chemical cure in a non-sag consistency. Meets ASTM C-920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O, I and Federal Specification TT-S-00227E, Type II, Class A. Tested in accordance with ASTM C-1382 for use in EIFS systems.
Where to use	■ Intended for use in all properly designed working joints with a minimum depth of 1/4 inch. ■ Ideal for vertical and horizontal applications. ■ Placeable at temperatures as low as 40°F. ■ Adheres to most substrates commonly found in construction. ■ An effective sealant for use in Exterior Insulation Finish Systems (EIFS). ■ Submerged environments, such as canal and reservoir joints.
Advantages	■ Capable of ±50% joint movement. ■ Chemical cure allows the sealant to be placed in joints exceeding ы in. in depth. ■ High elasticity with a tough, durable, flexible consistency. ■ Exceptional cut and tear resistance. ■ Exceptional adhesion to most substrates without priming. ■ Available in 40 architectural colors. ■ Color uniformity assured via Color-pak system. ■ Available in pre-pigmented Limestone Gray (no Color-pak needed). ■ Non-sag even in wide joints. ■ Easy to mix. ■ Paintable with water-, oil-, and rubber-base paints. ■ ANSI/NSF 61 approval for contact with potable water. ■ Jet fuel resistant.
Coverage	1 gal. yields 231 cu. in. or 154 lin. ft. of a 1/2 in. x 1/4 in. joint.
Packaging	1.5 gal. unit. 3 gal units. Color-pak is purchased separately. Limestone Gray color available pre-pigmented.

Typical Data *(Material and curing conditions 73°F (23°C) and 50% R.H.)*

Shelf life	One year in original, unopened containers.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). **Condition material to 65°-75°F before using.**	
Colors	A wide range of architectural colors are available. Special colors available on request.	
Application Temperature	40° to 100°F, ambient and substrate temperatures. Sealant should be installed when joint is at mid-range of its anticipated movement.	
Service Range	-40° to 170°F (-40°-75°C).	
Curing Rate (ASTM C-679)		
Tack-Free Time	6-8 hrs.	
Final Cure	3 days	
Application Life	3-4 hrs.	
Tear Strength	ASTM D-624	45 lb./in.
Shore A Hardness	ASTM D-2240	25 ± 5
Tensile Properties (ASTM D-412)		
Tensile Strength at Break	120 psi	
Tensile Elongation	500%	
100% Modulus	70 psi	

Adhesion in Peel (Fed Spec. TT-S-00227E)

Substrate	Peel Strength	% Adhesion Loss
Concrete	25 lb.	Zero

Weathering Resistance	Excellent
Chemical Resistance	Good resistance to water, diluted acids, diluted alkalines, and residential sewage. Consult Technical Service for specific data.

How to Use

Surface Preparation All joint-wall surfaces must be clean, sound, and frost-free. Joint walls must be free of oils, grease, curing compound residues, and any other foreign matter that might prevent bond. Ideally this should be accomplished by mechanical means.Bond breaker tape or backer rod must be used in bottom of joint to prevent bond.

Priming

Priming is typically not necessary. Most substrates only require priming if sealant will be subjected to water immersion after cure. Testing should be done, however, on questionable substrates, to determine if priming is needed.

Consult Technical Service or Sikaflex Primer Technical Data Sheet for additional information on priming.

Note: Most Exterior Insulation Finish Systems (EIFS) manufacturers recommend the use of a primer. When EIFS manufacturer specifies a primer or if on-site bond testing indicates a primer is necessary, Sikaflex 429 primer is recommended. On-site adhesion testing is recommended with final system prior to the start of a job.

Mixing

Pour entire contents of Component ‘B’ into pail of Component ‘A’. Add entire contents of Color-pak into pail and mix with a low-speed drill (400-600 rpm) and Sikaflex paddle.* Mix for 3-5 minutes to achieve a uniform color and consistency. Scrape down sides of pail periodically. Avoid entrapment of air during mixing.

When mixing in cold weather (<50°F), do not force the mixing paddle to the bottom of the pail. After adding Component ‘B’ and Color-pak into Component ‘A’, mix the top 1/2 to 3/4 of the pail during the first minute of mixing. After scraping down the sides of the pail, mix again for another minute. The paddle should reach the bottom of the pail between the first and second minute of mixing. Scrape down the sides of the pail a second time and then mix for an additional 2-3 minutes until the sealant is well blended.

Color-pak must be used with tint base. For pre-pigmented Limestone base, just mix with low speed drill and Sikaflex paddle (no Color-pak needed).

Application

Recommended application temperatures 40°-100°F. Pre-conditioning units to approximately 70°F is necessary when working at extremes. Move pre-conditioned units to work areas just prior to application.

Apply sealant only to clean, sound, dry, and frost-free substrates. Sikaflex-2c should be applied into joints when joint slot is at mid-point of its designed expansion and contraction.

To place, load directly into bulk gun or use a follower plate loading system. Place nozzle of gun into bottom of joint and fill entire joint. Keeping the nozzle deep in the sealant, continue with a steady flow of sealant preceding nozzle to avoid air entrapment. Also, avoid overlapping of sealant since this also entraps air. Joint dimension should allow for 1/4 inch minimum and 1/2 inch maximum thickness for sealant. Proper design is 2:1 width to depth ratio. Tool sealant to ensure full contact with joint walls and remove air entrapment.

Limitations

- The ultimate performance of Sikaflex-2c NS depends on good joint design and proper application.
- Minimum depth in working joint is 1/4 in.
- Maximum expansion and contraction should not exceed 50% of average joint width.
- Do not cure in the presence of curing silicones.
- Avoid contact with alcohol and other solvent cleaners during cure.
- Allow 3-day cure before subjecting sealant to total water immersion.
- Avoid exposure to high levels of chlorine. (Maximum level is 5 ppm).
- Do not apply when moisture vapor transmission exists since this can cause bubbling within the sealant.
- Avoid over-mixing sealant.
- Light color shades tend to yellow over time when exposed to ultraviolet rays.
- Light colors can yellow if exposed to direct gas fired heating elements.
- When overcoating: an on-site test is recommended to determine actual compatibility.
- The depth of sealant in horizontal joints subject to traffic is 1/2 inch.
- In horizontal joints exposed to vehicular or foot traffic, “TG” additive is recommended. See Sikaflex-2c NS TG data sheet for specific details.

Caution

Component ‘A’; Irritant - Avoid contact. Product is a skin, respiratory and eye irritant. Use of safety goggles and chemical resistant gloves recommended. Use of a NIOSH approved respirator required if PELs are exceeded. Use with adequate ventilation.

Component ‘B’; Combustible; Sensitizer; Irritant - Contains Xylene. Keep away from heat, sparks and open flame. Use with adequate ventilation. Product is a respiratory and skin sensitizer. Avoid contact. Product is an eye, skin, and respiratory irritant. Use of safety goggles and chemical resistant gloves recommended. Use of a NIOSH approved respirator required if PELs are exceeded.

First Aid

Eyes – Rinse eyes thoroughly for fifteen minutes. Contact physician. **Skin** – Wash affected area thoroughly with soap and water. Remove contaminated clothing. If irritation persists contact physician. **Inhalation** – Remove to fresh air. If breathing stops, institute artificial respiration. Contact physician. **Ingestion** – Dilute with water. Contact physician.

Clean Up

Uncured material can be removed with approved solvent. Cured material can only be removed mechanically. For spillage, collect, absorb, and dispose of in accordance with current, applicable local, state, and federal regulations.

Visit our website at www.sikaconstruction.com **1-800-933-SIKA NATIONWIDE**

Regional Information and Sales Centers. For the location of your nearest Sika sales office, contact your regional center.

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Sika Mexicana S.A. de C.V.
Carretera Libre Celaya Km. 8.5
Fracc. Industrial Balvanera
Corregidora, Queretaro
C.P. 76920
Phone: 52 442 2385800
Fax: 52 442 2250537

ISO 9000:2000

BASF

The Chemical Company

PRODUCT DATA

7 07 18 00 **Traffic Coatings**

SONOGUARD®

Polyurethane waterproofing, traffic-bearing membrane systems for vehicular and pedestrian areas

Description

Sonoguard® waterproofing systems are composed of:

SONOGUARD® BASE COAT, a one-component, moisture-curing polyurethane,

SONOGUARD® TOP COAT, a one-component aliphatic moisture-curing polyurethane,

SONOGUARD® TOP COAT TINT BASE, consisting of 40 standard colors, (see Form No. 1017936).

For projects requiring primer, two choices are available:

PRIMER 772 VOC, a one-component solvent-based primer and sealer,

PRIMER 770, a two-component waterborne epoxy primer and sealer.

Yield

See chart on page 3.

Packaging

Primer 772 VOC:
5 gallon (18.93 L) pails

Primer 770:
4 gallon (15.14 L) units in 5 gallon pails (18.93 L)

Base Coat, (self-leveling and slope-grade):
5 gallon (18.93 L) pails
55 gallon (208 L) drums

Top Coat:
5 gallon (18.93 L) pails
55 gallon (208 L) drums

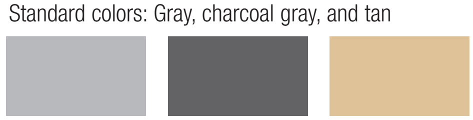
Top Coat Accelerator: 1 pint (473 mL) cans

Sonoguard® Adhesion Promoter (for recoat applications): 0.5 pint (236 mL) cans

Features	Benefits
• Meets EPA National requirements for VOC	Environmentally responsible
• Primer coat not typically required	Reduces labor and material costs
• Waterproof	Protects concrete from freeze/thaw damage; protects occupied areas below from water damage
• Excellent chloride resistance	Protects from chloride intrusion; extends the life of reinforcing steel
• Seamless elastomeric membrane	Offers excellent durability and superior abrasion resistance, has no seams that may result in leaks
• Skid resistant	Increases safety
• Multiple systems available	Ideal for various vehicular or pedestrian traffic solutions
• Repairable and recoatable	Extends the useful life of the system

Color

Standard colors: Gray, charcoal gray, and tan



Colors are approximate; conduct final color matching with actual material. For special colors, refer to Sonoguard® Top Coat Tint Base (Form No. 1017936).

Shelf Life

SONOGUARD® BASE COAT AND SONOGUARD® TOP COAT:
5 gallon pails, 1 year when properly stored.

SONOGUARD® BASE COAT AND SONOGUARD® TOP COAT:
55 gallon drums, 6 months when properly stored.

TOP COAT ACCELERATOR, PINT CANS:
2 years when properly stored.

SONOGUARD® ADHESION PROMOTER:
1 year when properly stored.

Storage

Store in unopened containers in a cool, clean, dry area.

Where to Use

APPLICATION

- Parking garages
- Stadiums
- Balconies
- Mechanical rooms
- Plaza decks

LOCATION

- Exterior or interior
- Above grade
- Suspended slabs

SUBSTRATE

- Elevated concrete slabs
- Exterior-grade plywood

Sonneborn®

Technical Data

Composition

Sonoguard® is a moisture-curing polyurethane membrane.

Compliances

- UL 790 Class A Fire Rating
- ASTM C 957
- ASTM E 108
- ASTM E 84

SEALANT • WATERPROOFING & RESTORATION INSTITUTE

Issued to: BASF Building Systems
Product: Sonoguard Base Coat & Sonoguard Top Coat

ASTM D 412: Tensile Strength of Top Coat
Sonoguard Top Coat
Tensile Strength: 2,415 psi;
Elongation: 490% Pass ✔

ASTM D 4541: Adhesion of Base Coat
Sonoguard Base Coat
Pull-off Adhesion: 300 psi Pass ✔

ASTM D 4060: Abrasion Resistance of Top Coat
Sonoguard Top Coat
Abrasion Resistance: 10 mgms loss
– mgms loss/1,000 cycles Pass ✔

Validation Date: 1/11/08-1/10/13

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DECK COATING VALIDATION
www.swrionline.org

Test Data

PROPERTY*	RESULTS BASE COAT	TOP COAT	TEST METHOD
Weight per gallon, lbs (kg)	9.9 (4.5)	9.1 (4.1)	ASTM D 1475
Specific gravity, kg/L	1.19	1.09	
Solids			ASTM D 1259
By weight, %	84	77	
By volume, %	81	75	
Viscosity, cps	4,000 – 9,000	2,000 – 4,000	ASTM D 2393
Flash Point, ° F (° C)	104 (40)	105 (40.5)	ASTM D 56

*Uncured material

PROPERTIES OF CURED MEMBRANES

PROPERTY	RESULTS BASE COAT	TOP COAT	TEST METHOD/ REQUIREMENTS
Hardness, Shore A	60	89	ASTM D 2240
Tensile strength, psi (MPa)	752 (5.2)	2,500 (17.2)	ASTM D 412
Elongation, %	595	502	ASTM D 412
Tear strength, PIT	74	199	ASTM D 1004
Weight loss, %	16	17	Max: 40
Low temperature flexibility and crack bridging	No Cracking	No Cracking	No Cracking
Adhesion in peel after water immersion, pli,			
Primed mortar	43	N/A	5
Plywood	34	N/A	5
Adhesion (Pull-off), psi			
Base Coat	275		ASTM D 4541

CHEMICAL RESISTANCE TENSILE RETENTION (ASTM C 957)

CHEMICAL	RESULTS BASE COAT	TOP COAT	REQUIREMENTS
Ethylene glycol	88	92	Min: 70
Mineral spirits	47	60	Min: 45
Water	96	83	Min: 70

Test results are averages obtained under laboratory conditions. Reasonable variations can be expected.

SONOGUARD® SYSTEM WEATHERING RESISTANCE AND ELONGATION RECOVERY (ASTM C 957)

PROPERTY	RESULTS		REQUIREMENTS
Elongation recovery, %	94		Min: 90
Tensile retention, %	151		Min: 80
Elongation retention, %	94		Min: 90
Abrasion resistance, mg lost; CS-17 Wheel, 1,000 g load, 1,000 cycles	1 — system passes	Max: 50	
Crack bridging, 1,000 cycles	System passes	—	

Test Data, cont.

	LIGHT TO MED TRAFFIC & PEDESTRIAN	HEAVY DUTY (REFUSAL METHOD)	EXTRA HEAVY DUTY (REFUSAL METHOD)
Base coat			
Wet mils (mm)	25 (0.6)	25 (0.6)	25 (0.6)
Dry mils (mm)	20 (0.5)	20 (0.5)	20 (0.5)
Coverage [1]	60 (1.5)	60 (1.5)	60 (1.5)
Mid coat			
Wet mils (mm)	None	20 (0.5)	25 (0.6)
Dry mils (mm)	None	15 (0.4)	20 (0.5)
Coverage [1]	None	80 (2.0)	60 (1.5)
Finish coat			
Wet mils (mm)	25 (0.6)	20 (0.5)	20 (0.5)
Dry mils (mm)	20 (0.5)	15 (0.4)	15 (0.4)
Coverage [1]	60 (1.5)	80 (2.0)	80 (2.0)
Aggregate [2]			
lbs per 100 ft^2	10 – 15	30 – 50	50 – 70
(kg/m^2)	(0.5 – 0.7)	(1.5 – 2.5)	(2.5 – 3.4)

Coverage rates are approximate and may vary due to the application technique used.
Actual coverage rate will also depend on finish and porosity of the substrate.

[1] Coverage is ft^2/gal (m^2/L)

[2] (16 – 30 mesh rounded silica sand or proportional equivalent)

How to Apply

Surface Preparation

CONCRETE

1. Concrete must be fully cured (28 days), structurally sound, clean, and dry (ASTM D 4263). All concrete surfaces (new and old) must be shotblasted to remove previous coatings, laitance, and all miscellaneous surface contamination and to provide profile for proper adhesion. Abrasive shotblasting must occur after concrete repair has taken place. Acid-etching is not permitted. Proper profile should be a minimum of ICRI CSP-3 (approximately 80 – 100 grit sandpaper).

2. Repair voids and delaminated areas with BASF Construction Chemicals branded cementitious and epoxy patching materials. For application when fast-turn around repairs are required, Conipur® 265 can be used to repair patches up to 1" (25 mm) in depth. Please refer to Technical Service for proper application techniques.

SURFACE PRE-STRIPING AND DETAILING

1. For nonmoving joints and cracks less than 1/16" (1.6 mm) wide, apply primer when required, followed by 25 wet mils (0.6 mm) prestriping of Base Coat. The Base Coat must be applied to fill and overlap the joint or crack 3" (76 mm) on each side. Feather the edges.

2. Dynamic cracks and joints 1/16" (1.6 mm) and greater wide must be routed to a minimum of 1/4 by 1/4" (6 by 6 mm) and cleaned. Install bondbreaker tape to prevent adhesion of sealants to the bottom of joint. Prime joint faces only with Sonneborn® Primer 733 (see Form No. 1017962). Fill joints deeper than 1/4" (6 mm) with appropriate backer-rod and SL 1™/SL 2™ (slope grade or self-leveling) or NP 1™/NP 1™ sealants (see Form Nos. 1017903 and 1017911). For cracks, sealant should be flush with the adjacent concrete surface. For expansion joints, sealant should be slightly concave.

3. Sealed joints 1" (25 mm) or less can be coated over with Sonoguard®. Expansion joints exceeding 1" (25 mm) wide should not be coated over with Sonoguard® so that they can perform independently of the deck coating system.

4. Cut a 1/4 by 1/4" (6 by 6 mm) keyway into the concrete where the coating system will be terminated if no wall, joint, or other appropriate break exists. Fill according to instructions on cracks and joints over 1/16" (1.6 mm) wide.

5. Form a sealant cant into the corner at the junction of all horizontal and vertical surfaces (wall sections, curbs, columns). Prime with Primer 733 and apply a 1/2 – 1" (13 – 25 mm) wide bead of NP 1™ or NP 2™ sealants. Tool to form a 45° cant.

6. In locations of potential high movement, such as wall and slab intersections, apply 25 wet mils (0.6 mm) of Sonoguard® Base Coat and embed Sonoshield® Reinforcing Fabric.

METAL SURFACES

1. Remove dust, debris, and any other contaminants from vent, drain-pipe, and post penetrations; reglets; and other metal surfaces.

2. Clean these surfaces to bright metal and prime immediately with Primer 733.

3. Provide appropriate cant with NP 1™, NP 2™, or Ultra sealant to eliminate 90° angles.

PLYWOOD

1. All plywood must be smooth-faced, APA-stamped, and exterior grade. Construction must conform to code, but plywood must not be less than 15/32" (12 mm) thick. Plywood spacing and deck construction must follow APA guidelines.

2. Surfaces must be free of contaminants. Priming is not necessary on clean, dry plywood.

3. All seams must be caulked with NP 1™ or NP 2™ sealants (see Form Nos. 1017906 and 1017911). Prestripe 4 – 6" (102 – 152 mm) wide with 25 wet mils (0.6 mm) of Base Coat. Reinforce all seams between plywood sheets and between flashing and the plywood deck by embedding Sonoshield® Reinforcing Fabric into the prestriping.

APPLICATION OF PRIMER

Priming

NOTE: When primer is required on a job, follow these steps. When applying Sonoguard® without using a primer, proceed to Application.

1. After thoroughly vacuuming the surface, apply Primer 772 VOC or Primer 770 to all the properly prepared deck surfaces at the rate of 200 – 250 ft²/ gallon (4.9 – 6.1 m²/L). Using a roller pan and a short- to medium-nap roller cover, force the primer into pores and voids to eliminate pinholes. Do not apply over prestriping. Use only solvent-resistant tools and equipment.

2. Allow primer to dry tack free. Base Coat must be applied the same working day.

Application of Base Coat

1. All preparatory work must be completed before application begins. Be certain the substrate is clean, dry, stable, and properly profiled. Sealants and prestriping should be properly cured. Apply the base, mid, and finish coats with a properly sized squeegee to arrive at the required mil thicknesses.

2. The best method to ensure the proper wet film thickness is the use of a grid system. Divide the surface to be coated into grids and calculate the square footage of each. Refer to the coverage chart to determine the quantity of Sonoguard® needed for each grid to arrive at the required mil thicknesses. For example, one pail of Sonoguard® Base Coat will cover an area approximately 300 ft² (28 m²), or a grid 30 by 10 ft (9 by 3 m) at 25 wet mils (0.6 mm). The mil thickness of all coats can also be verified by the use of a wet-mil thickness gauge.

3. Apply Base Coat 25 wet mils thick (0.6 mm) using a proper notched squeegee to entire deck surface, overcoating the properly prepared cracks, joints, and flashings. For sloped areas, use slope-grade Base Coat. Do not coat expansion joints over 1" (25 mm) wide.

4. Allow curing time of overnight (16 hour minimum). Slightly extend the curing time in cool or dry weather conditions. The surface of the base coat should have a slight tack. If the coating has been exposed for a prolonged period, consult Technical Service for recommendations.

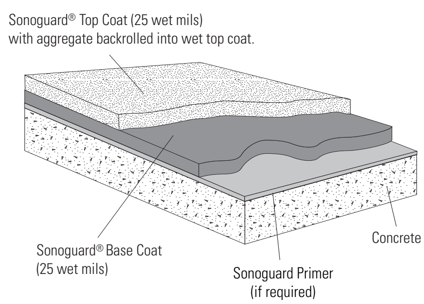
Application Methods of Systems

Sonoguard® can be applied in several different systems depending on the degree of traffic the system is exposed to. In areas of extreme traffic (turning lanes, pay booths, ramps, entrances and exits), apply the Extra Heavy-Duty Traffic System (refusal method). The following summary briefly describes each method. All coverage rates are approximate.

IMPORTANT NOTE: All coverage rates are approximate and may vary due to the application technique used. Actual coverage rate will depend on finish and porosity of the substrate.

LIGHT- TO MEDIUM- DUTY TRAFFIC & PEDESTRIAN SYSTEM

LIGHT TO MEDIUM DUTY TRAFFIC AND PEDESTRIAN SYSTEM



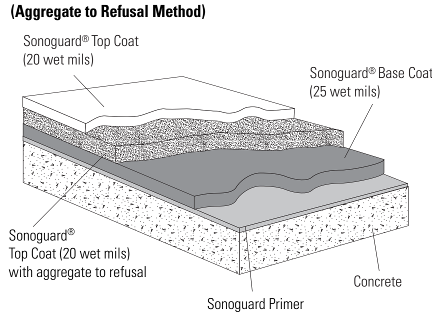
1. Prime concrete substrate (if required).

2. Apply 25 wet mils (0.6 mm) Sonoguard® Base Coat using a proper notched squeegee at 60 ft²/gallon (1.5 m²/L). Immediately backroll to level Base Coat. Allow to cure overnight.

3. Apply 25 wet mils (0.6 mm) Sonoguard® Top Coat using a proper notched squeegee at 60 ft²/gallon (1.5 m²/L). Immediately backroll to level Top Coat material. While the coating is still wet, broadcast Sonoguard® Aggregate or equivalent 16 – 30 rounded silica sand at 10 – 15 lbs/100 ft² (0.5 – 0.7 kg/m²), then backroll into the coating to fully encapsulate.

HEAVY-DUTY TRAFFIC SYSTEM

HEAVY DUTY TRAFFIC SYSTEM
(Aggregate to Refusal Method)



1. Prime concrete substrate (if required).

2. Apply 25 wet mils (0.6 mm) Sonoguard® Base Coat using a proper notched squeegee at 60 ft²/gallon (1.5 m²/L). Immediately backroll to level Base Coat. Allow to cure overnight.

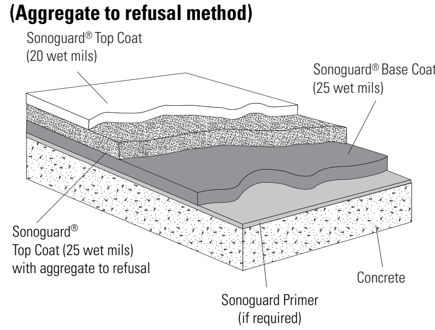
3. Apply 20 wet mils (0.5 mm) Sonoguard® Top Coat using a notched squeegee at 80 ft²/gallon (2.0 m²/L). Immediately backroll to level Top Coat. While coating is still wet, broadcast Sonoguard® Aggregate or 16 – 30 rounded silica sand to refusal at approximately 30 – 50 lbs/100 ft² (1.5 – 2.4 kg/m²). Allow to cure overnight.

4. Remove all loose aggregate, then apply 20 mils (0.5 mm) Sonoguard® Top Coat using a flat squeegee at 80 ft² per gallon (2.0 m²/L). Immediately backroll to level Top Coat.

5. For additional slip resistance, immediately broadcast Sonoguard or equivalent 16-30 rounded silica sand at a rate of 7-10 lbs/100 ft² (.34-.49 kg/m²) and backroll to encapsulate.

EXTRA HEAVY-DUTY SYSTEM

EXTRA HEAVY DUTY SYSTEM
(Aggregate to refusal method)



1. Prime concrete substrate (if required).

2. Apply 25 wet mils (0.6 mm) Sonoguard® Base Coat using a proper notched squeegee at 60 ft²/gallon (1.5 m²/L). Immediately backroll to level Base Coat. Allow to cure overnight.

3. Apply 25 wet mils (0.6 mm) Sonoguard® Top Coat using a proper notched squeegee at 50 ft²/gallon (1.2 m²/L). Immediately backroll to level Top Coat. While the coating is still wet broadcast Sonoguard® Aggregate or 16 – 30 rounded silica sand to refusal at 50 – 70 lbs/100 ft² (2.5 - 3.4 kg/m²). Allow to cure overnight.

4. Remove all loose aggregate, then apply 20 wet mils (0.5 mm) Sonoguard® Top Coat using a flat squeegee at 80 ft²/gallon (2.0 m²/L). Immediately backroll to evenly level Top Coat.

5. For additional slip resistance, immediately broadcast Sonoguard aggregate or equivalent at a rate of 7-10 lbs/100ft² (.34-.49 kg/m²) and backroll to encapsulate.

Mockup

Provide mockup of at least 100 ft^2 (9.3 m^2) to include surface profile, sealant joint, crack, flashing, and juncture details and allow for evaluation of slip resistance and appearance of Sonoguard® Systems.

1. Install mockup with specified coating types and with other components noted.
2. Locate where directed by architect.
3. Mockup may remain as part of work if acceptable to architect.

For recoat applications, see Sonoguard® Recoat System product data sheet.

Curing Time

Allow curing time of 72 hours before vehicular use and 48 hours before pedestrian use. Extend the curing time in cool-weather conditions. To reduce the timeframe in which Sonoguard® might be vulnerable to inclement weather or to reduce the time between coats, use Sonoguard® Top Coat Accelerator.

Maintenance

1. Portions of the membrane that exhibit wear are considered a maintenance item, and are not considered a warrantable item.
2. Surfaces may be cleaned with commercial detergents. Sonneborn recommends that a maintenance agreement be established between the owner and applicator.
3. Periodic inspection and repair of damaged surfaces will greatly prolong the performance and life of the system.
4. Remove all sharp debris, such as sand, gravel, and metal on a regular basis to avoid damage to the coating.
5. When removing snow, avoid the use of metal blades or buckets that may damage the coating.

Clean Up

Clean all tools and equipment with Reducer 990 or xylene.

For Best Performance

- Concrete should have a minimum compressive strength of 3,000 psi (20.7 MPa) and be cured for a minimum of 28 days.
- For slab on grade applications please contact BASF representative.
- Be sure to allow for movement in the deck by the proper design and use of expansion and control joints.
- When applying sealants, use backing materials according to industry standards.
- Do not apply when substrates are over 110° F (32° C) or under 40° F (4° C).
- When used interior, provide adequate ventilation with a minimum of 6 air changes per hour.
- When adequate ventilation for use of Sonoguard® cannot be maintained, refer to product data sheet for Conipur II Deck Coating System (Form No. 1017917).
- Be certain that all aggregate not properly encapsulated is thoroughly removed.
- On steep ramps in excess of 15%, contact your local BASF representative.
- Sonoguard® Aggregate 16/30, rounded select silica sand is recommended.
- When applying to metal pan decks or decks containing between-slab membranes, contact Technical Service.
- Select the proper amount of aggregate to promote slip resistance.
- Prestripe to level out recessed sealant joints (less than 1" [25 mm]) for optimal aesthetic appearance.
- Avoid application of Sonoguard® when inclement weather is present or imminent.
- Do not apply Sonoguard® to damp, wet, or contaminated surfaces.
- Sonoguard® is not suitable for use where chained or metal-studded tires will be used.
- Make certain the most current versions of product data sheet and MSDS are being used; call Customer Service (1-800-433-9517) to verify the most current versions.
- Proper application is the responsibility of the user. Field visits by BASF personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

Troubleshooting

Problem—likely causes:

Irregular appearance—substrate too rough, uneven coating application, uneven aggregate distribution. SOLUTION: Recoating may improve appearance. The number of additional coat(s) is dependent on the degree of irregularity. A sample recoat should be done.

Premature wear over high spots—failure to grind down abnormally rough concrete or junctions of slabs that do not line up evenly. SOLUTION: Grind high areas. Recoat affected area with entire Sonoguard® system.

Uneven aggregate distribution—casting aggregate into an uneven coating, not casting aggregate consistently. SOLUTION: Aggregate should be evenly distributed before encapsulation. If the surface cures unevenly, a recoat may improve appearance. Use a sample area to gauge results of recoat.

Inadequate slip resistance—inconsistent coating application, failure to properly embed aggregate, overly heavy finish coat. SOLUTION NO. 1: When installing aggregate to refusal method, incorporate an additional 10 lb/100 ft^2 (0.5 kg/m^2) aggregate into the final lock coat. SOLUTION NO. 2: Start with a sample area. Lightly abrade surface to expose aggregate. Refer to Sonoguard® Recoat product data sheet.

Blisters—coating application too heavy or a wet substrate. SOLUTION: Cut blisters and spot repair as needed.

Poor adhesion to concrete—concrete surface too smooth (not properly profiled) or friable; concrete contaminated by dirt, oil, or moisture, etc. SOLUTION: Fix underlying problem, then reapply Sonoguard® system.

Intercoat adhesion is poor—preceding coat contaminated by dirt or moisture; topcoat applied past critical recoat time. SOLUTION: Fix underlying problem, then reapply Sonoguard® system. For additional information, contact Sonneborn® Technical Service.

Sagging in vertical applications—SOLUTION: Apply multiple thin coats of both base and top coats to achieve desired film thickness. If puddling does occur, backroll as soon as possible.

Health and Safety

SONOGUARD® BASE COAT

Warning

Sonoguard® Base Coat contains titanium dioxide, talc, calcium carbonate, calcium sulfate, stoddard solvent, toluene diisocyanate, and silicon dioxide.

Risks

Combustible liquid and vapor. Inhalation of vapors may cause irritation and intoxication with headaches, dizziness and nausea. May cause skin and eye irritation. Potential skin and/or respiratory sensitizer. Ingestion may cause irritation. Reports associate repeated or prolonged occupational overexposure to solvents with permanent brain, nervous system, liver and kidney damage. INTENTIONAL MISUSE BY DELIBERATELY INHALING THE CONTENTS MAY BE HARMFUL OR FATAL.

Precautions

KEEP OUT OF THE REACH OF CHILDREN. KEEP AWAY FROM HEAT, FLAME AND SOURCES OF IGNITION. Avoid contact with skin, eyes or clothing. Wash thoroughly after handling. DO NOT take internally. Use only with adequate ventilation. Use impervious gloves, eye protection and if the TLV is exceeded or used in a poorly ventilated area, use NIOSH/MSHA approved respiratory protection in accordance with applicable federal, state and local regulations. Keep container closed. All label warnings must be observed until container is commercially cleaned or reconditioned.

First Aid

In case of eye contact, flush thoroughly with water for at least 15 minutes. SEEK IMMEDIATE MEDICAL ATTENTION. In case of skin contact, wash affected areas with soap and water. If irritation persists, SEEK MEDICAL ATTENTION. Remove and wash contaminated clothing. If inhalation causes discomfort, remove to fresh air. If discomfort persists or any breathing difficulty occurs, or if swallowed, SEEK IMMEDIATE MEDICAL ATTENTION.

Refer to Material Safety Data Sheet (MSDS) for further information.

Proposition 65

This product contains materials which are known to the state of California as known to cause cancer, birth defects, or other reproductive harm.

VOC Content

Self-leveling grade: 1.63 lbs/gal or 196 g/L of VOC, less water and exempt solvents.

Flash/slope grade: 1.7 lbs/gal or 203.3 g/L of VOC, less water and exempt solvents.

SONOGUARD® TOP COAT

Warning

Sonoguard® Top Coat contains mineral spirits, talc, calcium sulfate, and methylene bis (4-cyclohexyl-isocyanate); it may also contain titanium dioxide and silicon dioxide.

Risks

Combustible liquid and vapor. May cause skin and eye irritation. May cause dermatitis and allergic responses. Potential skin and/or respiratory sensitizer. Inhalation of vapors may cause irritation and intoxication with headaches, dizziness and nausea. Ingestion may cause irritation. Reports associate repeated or prolonged occupational overexposure to solvents with permanent brain, nervous system, liver and kidney damage. INTENTIONAL MISUSE BY DELIBERATELY INHALING THE CONTENTS MAY BE HARMFUL OR FATAL.

Precautions

KEEP OUT OF THE REACH OF CHILDREN. KEEP AWAY FROM HEAT, FLAME AND SOURCES OF IGNITION. Keep container closed when not in use. Use only with adequate ventilation. Avoid contact with skin, eyes and clothing. Wash thoroughly after handling. Avoid breathing vapors. Use impervious gloves, eye protection and if the TLV is exceeded or if used in a poorly ventilated area, use NIOSH/MSHA approved respiratory protection in accordance with applicable federal, state and local regulations. Empty container may contain explosive vapors or hazardous residues. Do not cut or weld on or near empty container. All label warnings must be observed until container is commercially cleaned or reconditioned.

First Aid

In case of eye contact, flush thoroughly with water for at least 15 minutes. SEEK IMMEDIATE MEDICAL ATTENTION. In case of skin contact, wash affected areas with soap and water. If irritation persists, SEEK MEDICAL ATTENTION. Remove and wash contaminated clothing. If inhalation causes discomfort, remove to fresh air. If discomfort persists or any breathing difficulty occurs, or if swallowed, SEEK IMMEDIATE MEDICAL ATTENTION.

Refer to Material Safety Data Sheet (MSDS) for further information.

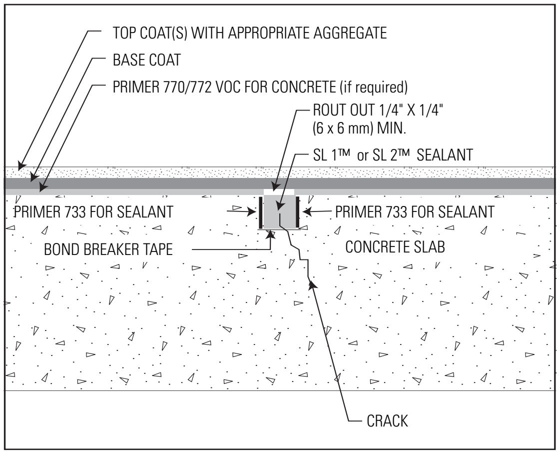
Proposition 65

This product contains material listed by the state of California as known to cause cancer, birth defects, or other reproductive harm.

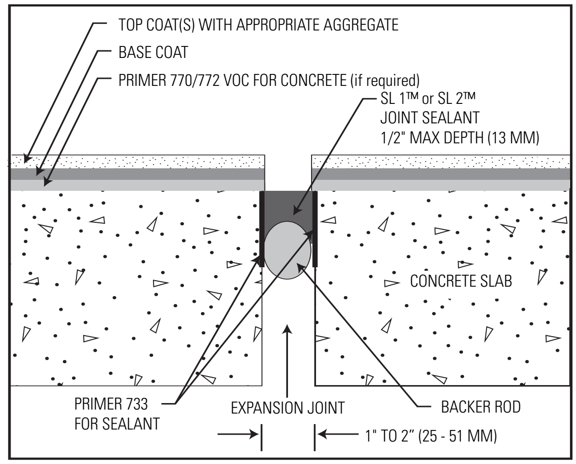
VOC Content

1.75 lbs/gal or 209 g/L of VOC, less water and exempt solvents.

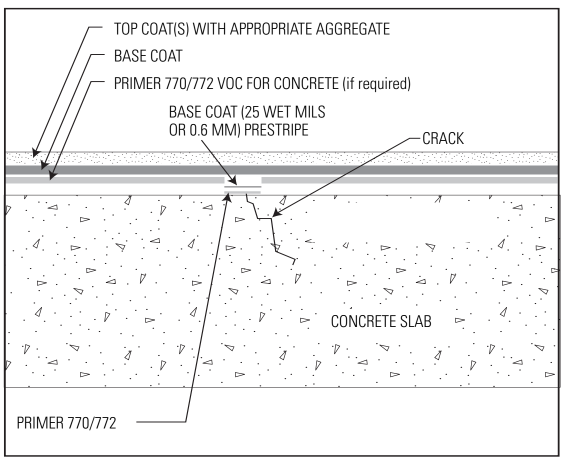
**For medical emergencies only,
call ChemTrec (1-800-424-9300)**



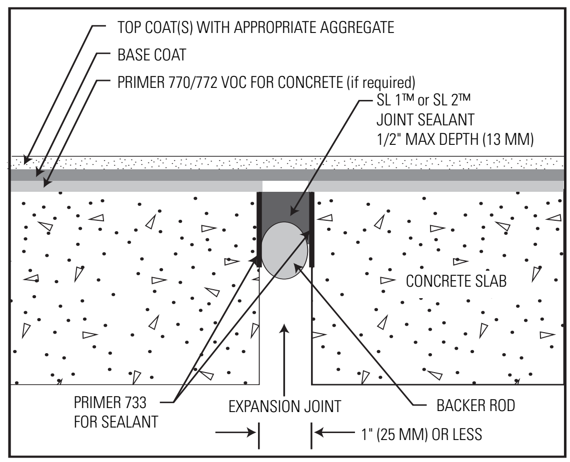
Crack Detail (Dynamic)



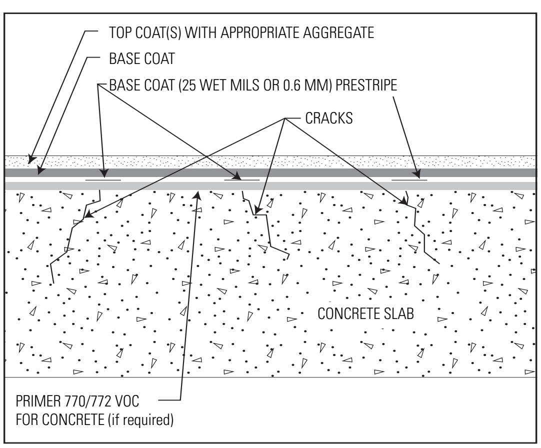
Expansion Joint Detail (Greater Than 1")



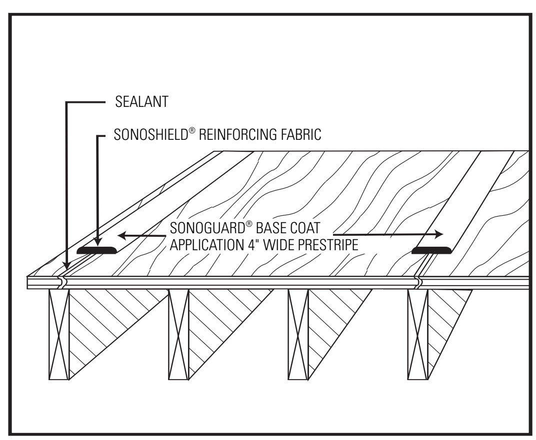
Crack Detail (Static)—Sporadic Cracking



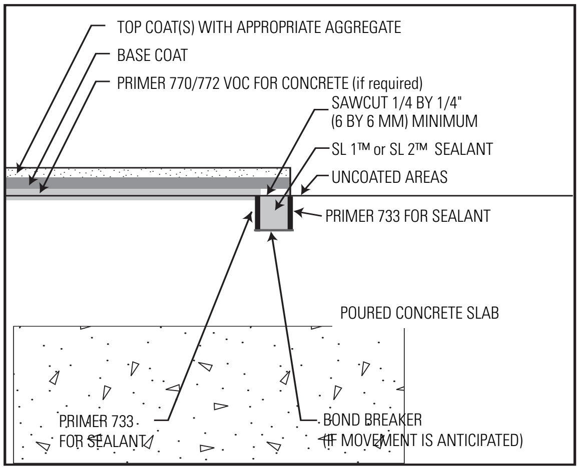
Expansion Joint Detail (Less Than 1")



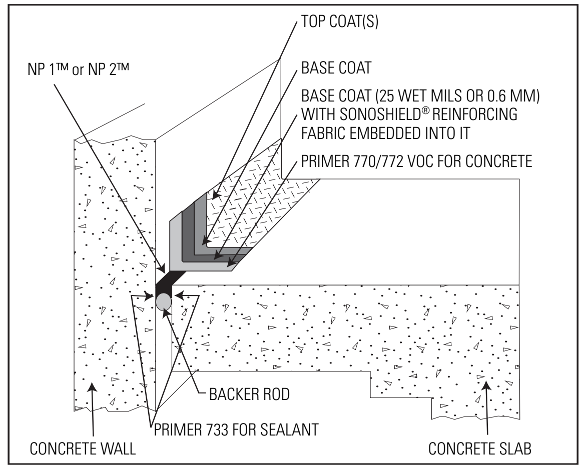
Crack Detail (Static)—Alternate Option for Widespread Cracking



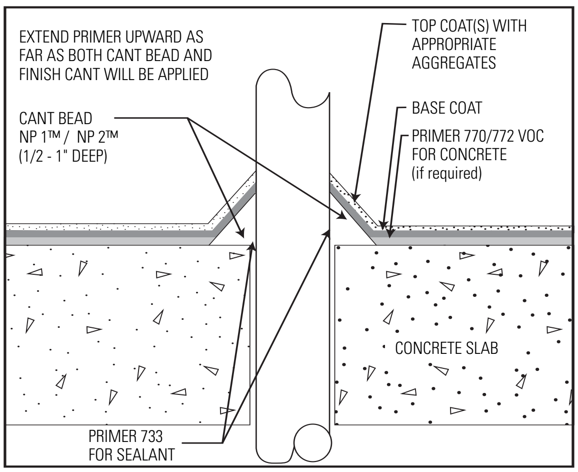
Plywood Application (Seam Detail)



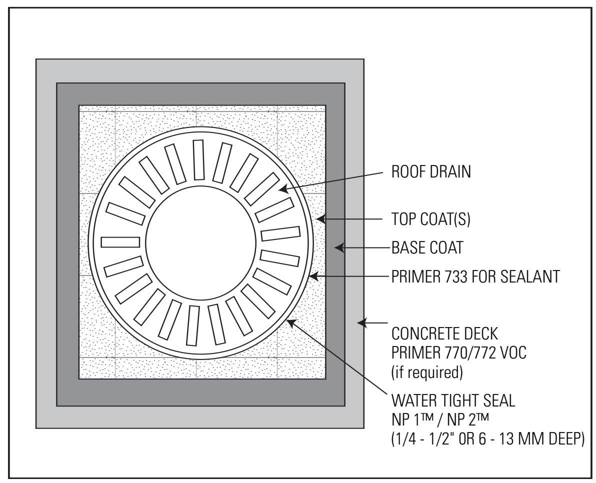
Key-Way or Termination Detail



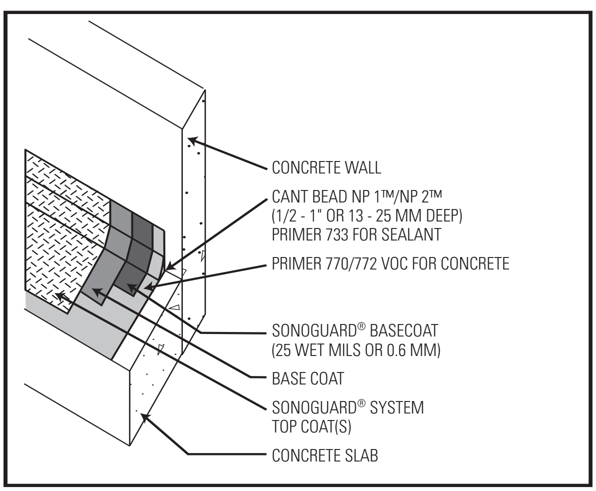
Joint at Wall/Slab



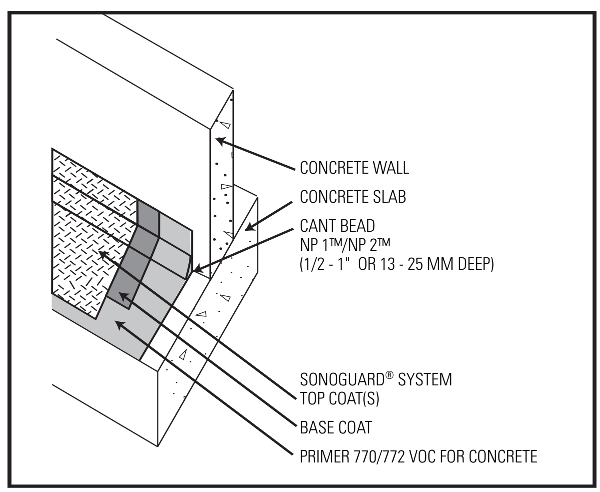
Penetration Detail



Roof Drain



Slab Abutting Wall



Wall Bearing on Slab

BASF Construction Chemicals, LLC – Building Systems

889 Valley Park Drive
Shakopee, MN, 55379

www.BuildingSystems.BASF.com

Customer Service 800-433-9517
Technical Service 800-243-6739

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APPENDIX G: SUPPORTING INFORMATION - COMMUNICATIONS

HARVARD UNIVERSITY
Harvard Real Estate Services

PEABODY TERRACE PROJECT UPDATE
October 14, 2009

As you may know, Harvard is beginning a comprehensive, multi-year repair and waterproofing program on the exterior facade and balconies of the Peabody Terrace complex. While conducting this work, low levels of chemicals called PCBs (Polychlorinated Biphenyls) were found in some building materials, particularly the exterior caulking used for waterproofing. The University's Department of Environmental Health and Safety is working closely with Harvard Real Estate Services and environmental and safety consultants to analyze these conditions.

To date we can report that PCB levels found at the Peabody Terrace complex are below levels associated with public health risk and do not pose a hazard to our community.

It is important to note that because PCBs were commonly used in building materials several decades ago, detectable amounts are frequently found in the environment.

We prioritized inspection of the day care center and common areas frequented by children and have found no cause for concern in these areas. Similarly, samples from the interiors of apartments inspected to date have shown either no detectable PCBs, or very low concentrations that are well below those associated with health risk. Low but detectable levels of PCBs have been found in some soil samples and other exterior surfaces. Although these findings do not require immediate action, Harvard has taken a number of precautionary steps in play areas which include sealing caulking, installing protective barriers and mulching certain landscaped areas.

While it has been determined there is not a health risk, we realize you may have questions. For your convenience, we are hosting a drop-in information session on Friday, October 16 from 1:30 to 3:30 pm at the Peabody Terrace Common Room with our technical experts who have worked on similar projects.

During the repair and waterproofing project, Harvard will take permanent measures as required by applicable federal and state environmental protection laws. It will take some time to fully examine conditions and design a repair and removal program, but we anticipate that work will include removal of PCB-containing caulk and some soil. To minimize disruption, the work will be done in conjunction with the major work of facade repair and waterproofing. We will keep you informed as the work progresses.

In the meantime, if you have any questions, please call Ed LeFlore of the Harvard University Construction Mitigation office at (617) 496-0857 or send an email to eleflore@csl-consulting.com. We will do our best to get back to you promptly.

Further information can also be found on the Environmental Protection Agency website:
http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm

PEABODY TERRACE FAÇADE PROJECT
COMMUNICATION TEAM

Harvard Environmental Health & Safety Department
- Joe Griffin, EH&S Director
- Karen Sardone, Sr. EH&S Project Manager

Technical Experts
- Jeff Hamel, Sr. Vice President (Woodard & Curran)
- Terri Bowers, Risk Communicator (Gradient Corp.)

Harvard Real Estate Services
- Steve Nason, Director of Residential Real Estate
- Justin Stratman, Assistant Director, Property Operations
- Chris Packard, Project Manager, PT Façade Project (JLL)

Harvard University Health Services
- Dr. Rosenthal, Director of University Health Services

Harvard Construction Mitigation Office
- Ed LeFlore, Construction Mitigation Officer

Harvard Community Affairs Office
- Tom Lucey, Director of Community Relations

Harvard Office of General Counsel
- Audrey Wang, University Attorney

PEABODY TERRACE FAÇADE PROJECT
COMMUNICATION PLAN

AUDIENCE	MEANS OF COMMUNICATION	NOTES
PT Building Staff	• Meeting 10/14/09 • Distribute Factsheet 10/14/09 • BMP Training 12/16/09	Best Management Practices (BMPs) for typical building operations were developed by EH&S, OGC and W&C; training was conducted by K. Sardone.
PT Daycare Staff	• Meeting 10/14/09 • Distribute Factsheet 10/14/09 • Drop-in Hours 10/16/09	2 drop-in sessions were held (morning and afternoon). Available staff included Joe Griffin, Steve Nason, Ed LeFlore, Terri Bowers and Dr. Rosenthal. T. Bowers provided general information on PCBs and outlined the specific data at Peabody Terrace. E. LeFlore provided general project details.
PT Daycare Parents	• Distribute Factsheet 10/14/09 • Drop-in Hours 10/16/09	See note above.
PT Tenants	• Distribute Factsheet 10/14/09 • Drop-in Hours 10/16/09	See note above.
University Construction Groups	• Distribute Factsheet 10/14/09 • Awareness training incorporated into overall PM Training Program	University Project and Building Managers are provided awareness training regarding potential PCB caulk issues as part of their overall EH&S training.
University Property Managers	• Distribute Factsheet 10/14/09 • Awareness training incorporated into overall PM Training Program	See note above.
University News Office	• Distribute Factsheet 10/14/09	
Cambridge City Manager	• Telephone call 10/14/09 • Fax Factsheet 10/14/09	City officials were provide general project information and the factsheet in case they got questions directly from concerned parties.
Cambridge DPH	• Telephone call 10/12/09 • Fax Factsheet 10/14/09	See note above.